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INDEX

The radiologic appearances of diverticula of the male cavernous urethra. By *Nils P. G. Edling* 1
Vertebral angiography in cerebellar haemangioma. By *Olle Olsson* . . . 9
Percutaneous splenic venography. By *V. Gvozdanović, E. Hauptmann, E. Najman* and *B. Oberhofer* 17
A simple centering device for radiographic tubes. By *Ove Mattsson* . . . 27
A new instrument for hysterosalpingography. By *Lennart Kjellman* . . . 35
Radiation treatment of hemangiomas. By *Johannes Thoms* and *Niels Fjeldborg* 39
Ein Fall von sog. »Melanocarcinoma congenitum processus alveolaris« (Krompecher). Von *G. Notter* und *G. Söderberg* 54
Malignant lymphomata. By *Axel Scheel* † and *Eivind Myhre* 63
Book reviews 81

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THE RADIOLOGIC APPEARANCES OF DIVERTICULA OF THE MALE CAVERNOUS URETHRA

by

Nils P. G. Edling

In discussing diverticula of the cavernous urethra, it is, according to pathologists, necessary to separate such cavities due to cyst formation of the bulbourethral ('Cowperian') ducts, and those caused by a congenital disturbance in the closure of the urethral channel. The former are situated in the posterior portion of the cavernous urethra, the latter — which are very rare — in the penile urethra, in both cases on the inferior surface (HENKE and LUBARSCH 1934). Malformation of the bulbourethral ducts is not uncommon; in a systematic investigation of 645 autopsy subjects, ELBOGEN (1886) found fifteen small cysts, that is 2.3 per cent. In rare cases these cysts may cause urethral stenosis of a severe degree in small children (ELBOGEN, 1886).

It may be difficult to determine even pathologically if a paraurethral cavity is congenital or acquired. Undoubtedly, in small children paraurethral cavities are of congenital origin, and in cases of cyst formation of the bulbourethral ducts due to the retention of secretions, to folds or to adhesions, that cause prestenotic dilatations. In adults, cyst formation may be a sequel to circumscribed postinflammatory or posttraumatic shrinkage with stenosis of the ducts and prestenotic dilatation. Whenever possible, microscopic examination of the wall will show whether it is of urethral or bulbourethral origin, or whether the paraurethral cavity has appeared after abscess formation (*i. e.* 'a false diverticulum').

The urethrocystographic studies are in agreement with the beliefs previously held, *i. e.* that diverticula of the posterior portion of the cavernous urethra are not rare, whereas diverticula of the anterior portion are uncommon. In a series of 204 male patients with urologic symptoms the author, in 1945, found four of the former type (about 2 per

Submitted for publication, March 25, 1953.

From the Roentgen Diagnostic Department (Director: Professor K. LINDBLOM), Karolinska Sjukhuset, Stockholm, Sweden.

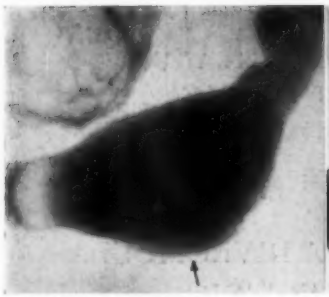

Fig. 1. Right oblique view. Inferior surface of urethra, left; oval paraurethral cavity of regular outline (arrow). Air-bubble in urethra.

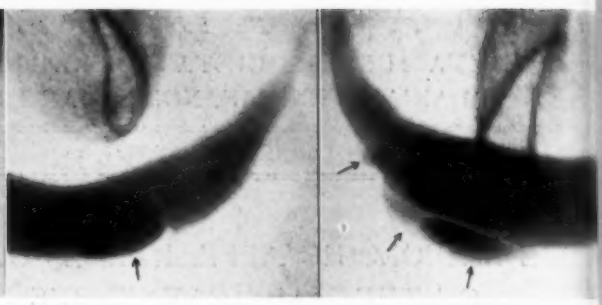

Fig. 2. Right and left oblique views. Inferior surface urethra, right: three paraurethral cavities of different size a row, with regular outlines (arrows). Impression into uret by the largest cavity.

Fig. 3. Right oblique view. Inferior surface of urethra, left: three large cavities (arrows); the proximal part of the bulbourethral duct (↑) opens into the most proximal cavity. Large urethrocavernous reflux (↑↑) at the inferior aspect of the urethra and the cavities.

cent) and none of the latter. In the Roentgen Diagnostic Department of the Paediatric Clinic of Karolinska Sjukhuset, two cases with diverticula of the first type were found in 246 boys with urologic symptoms (0.8 per cent). A case illustrated by KERR and GILLIES (Fig. B. p. 303 in The Urinary Tract, 1944), and a case illustrated by the author (Fig. 4669 in the Textbook of Roentgen Diagnosis by SCHINZ—BAENSCH—FRIEDL—UHLINGER, 1952) also had the cavities situated in the posterior portion of the cavernous urethra. The findings were not studied at length.

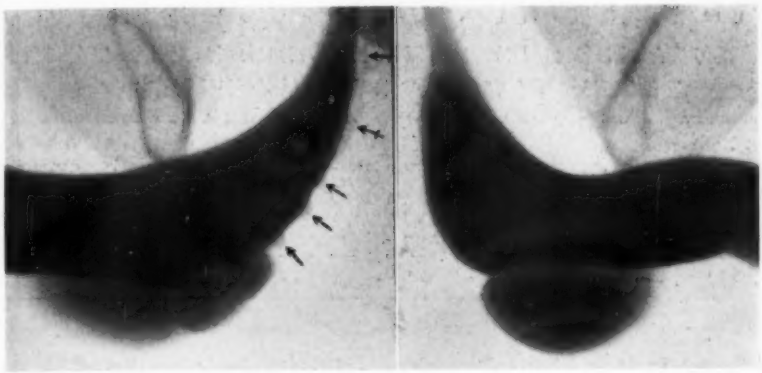

Fig. 4. Right and left oblique views. The left bulbourethral duct forms a row of two large and three small cavities (arrows); the largest is incompletely filled. The proximal part of the duct and the gland of normal appearances (↑). Regular outlines. On operation: a bilocular diverticulum.

The diverticula are not only of interest from the developmental point of view, but are also of differential diagnostic importance. In this paper 31 cases have been collected for further roentgenologic studies of the changes, which in 27 cases were situated in the posterior portion of the cavernous urethra and in 4 cases in the anterior portion.

The examinations were performed by the urethrocystographic method described by the author in 1945. The urethra was visualized in frontal and right and left oblique views during injection, and in similar oblique views during voiding. The cavities are demonstrated most clearly in oblique views, in the left oblique if the diverticula lie more to the right, in the right oblique in those lying more to the left. A diverticulum was often recognized in the homolateral oblique view as a thin linear defect in the urethral contrast shadow caused by parts of the urethral and bulbourethral walls lying adjacent to each other. Films obtained during injection usually gave the best information, although occasionally the most satisfactory films were those obtained during voiding, or when the urethra was partly emptied at the end of the examination.

In 24 out of the first 27 cases, the diverticula were situated in the lower part of the urethra where the bulbourethral ducts open, or in the ducts themselves. The outlines were in all cases smooth and regular. There were 1—5 diverticula in a row separated from the urethra by thin walls (Figs. 1, 2, 3, 4). They were more or less oval or round, the larger ones often flattened against the urethra, where a corresponding impression might be present. The smallest cavity was 1 × 6 mm, the largest,

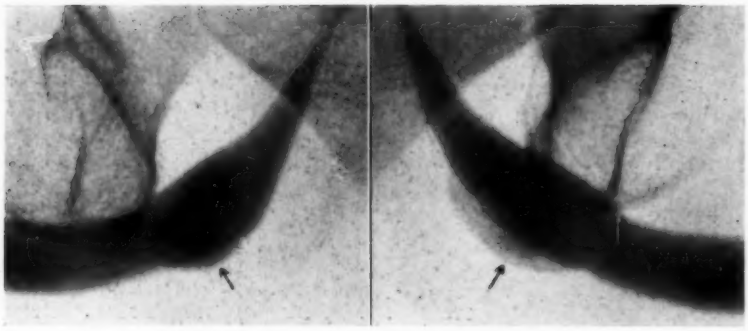

Fig. 5. Right and left oblique views. Inferior surface of urethra, right: a pear- or retort-shaped cavity of regular outline (arrows).

30 × 60 mm (measured on the films without taking foreshortening in the oblique views into account). In spite of the contrast-filling, it was, excepting in the case of the largest diverticula, not possible to demonstrate the communication between the urethra and the cavities. The diverticula were situated just to the left of the midline in 13 cases, just to the right of the midline in 10 cases and in the midline in one case. At the completion of the examination they emptied with the urethra.

In 10 of the 24 cases under discussion there was contrast filling, not only of the cavities, but also of the proximal part of the bulbourethral duct and, in some cases, of the bulbourethral (Cowperian) gland (Figs. 3, 4). The duct opened into the cavity or where more than one cavity existed, in the most proximal one. In 2 of the 10 cases, both ducts were contrast-filled: in the first, both ducts opened into a large diverticulum in the midline; in the second case, one duct opened into a diverticulum, the other opened through a dilated opening into the urethral lumen; the case is again mentioned below. The contours of the contrast-filled ducts were usually smooth; the width of the lumen was not greater than 2 mm. The 10 cases indicated that the diverticula of the type under discussion were local dilatations of the bulbourethral ducts; there is in general no difference in the appearance of the cavities in the remaining 14 cases, in which the bulbourethral ducts were not completely contrast-filled.

In the remaining 3 of the first 27 cases, only the bulbourethral duct on one side was contrast-filled and dilated. In addition, one of the cases with bilateral duct-filling, described above, showed evidence of a dilatation on one side. The dilatation localized to the lower end of the duct, varied between 3—8 mm. In 2 of these 4 cases, the urethral end of the duct was the widest part. In the remaining 2 cases, the dilatation seemed

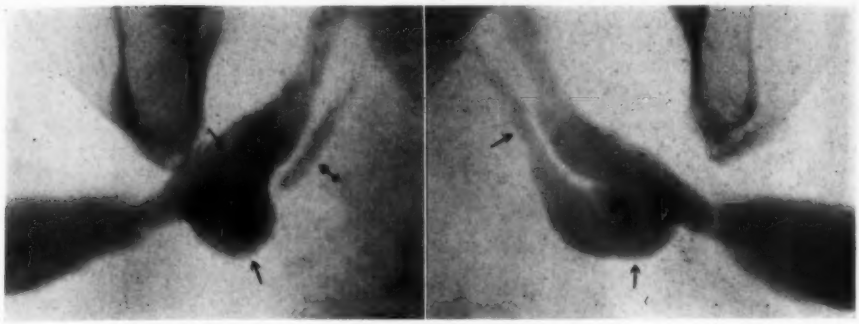

Fig. 6. Right and left oblique views. Contrast-filling of bulbourethral ducts and glands. The right duct (arrows) is dilated, particularly distally, and pear-shaped; the opening into urethra is narrow; regular outlines. The left duct (‡) is about 2 mm broad and of irregular appearance. Stricture of urethra. — Four years previously only the right bulbourethral duct was contrast-filled; it was less dilated and there was no stricture.

to be caused by a narrowing of the opening, the dilated ducts being pear- or retort-shaped (Figs. 5, 6).

Of the 27 cases under discussion, all had a history of lower urinary tract symptoms. In some cases certain transurethral procedures (introduction of a sound, electro-resection etc.) had been carried out. The possibility of infection or traumatic lesion cannot be excluded therefore as a cause of the diverticula formation and in spite of the smooth contours, the abnormal findings may not all be accepted as being due to congenital anomalies. However, if an acquired lesion has been present, it has led to one or more circumscribed narrowings of the bulbourethral ducts followed by secondary prestenotic dilatations. In this way the difference in incidence between the adult and child series may be explained.

The material demonstrates different types of dilatations of the bulbourethral ducts, and it is possible to show transitions from one type to another (compare Figs. 1, 5, 6). In this way the roentgenologic findings confirm the modern theories of pathology on the origin of diverticula of the posterior part of the cavernous urethra.

The dilatation of the end part of the bulbourethral duct in two of the cases cannot be explained in the same way. It seems as if the cause may be either a congenital malformation, or a dilatation due to a disturbance in the closing mechanism of the end part of the duct; this may be congenital or acquired.

The remaining four of the total 31 cases had a different character, site and shape from those described above. The cavity was situated in the penile part of the cavernous urethra in all cases; the contours were

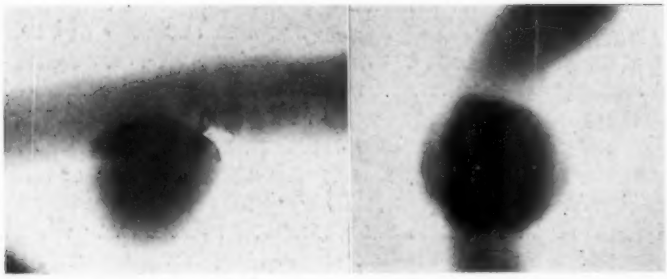

Fig. 7. Right oblique, and frontal views. Inferior surface of the penile urethra: rounded regular cavity.

smooth and the shape rounded in two cases (Fig. 7), oval with a broad communication with the urethra in one case, and there was a local urethral dilatation in the fourth. As in the other cases, there were histories of infection, concretions and hypertrophy. In spite of that, the appearances suggested preformed cavities or dilatations, and not formations secondary to urethral wall changes. Diagnosis can of course only definitely be confirmed by the help of histologic examination of the wall.

The different forms of diverticula of the cavernous urethra described above may be difficult to separate from other paraurethral changes.

Firstly, there are dilatations of the bulbourethral ducts due to the spread of postinflammatory changes in the walls. With incomplete duct filling, the radiologic appearances of the two states of affairs may be very similar (Fig. 8). However, the width of the lumen and the contours are often irregular, the former not more than 1—2 mm (Figs. 6, 8). The ducts do not end in smooth cavities but open directly into the urethra, usually by a visible communication. In addition the urethra also often has an irregular lumen due to strictures, and to small paraurethral cavities on the superior surface of the lumen (Fig. 6).

Paraurethral cavities due to fistula formation must also be kept in mind. If the irregular passages, temporary or permanent, are closed, a paraurethral cavity may remain. The history and the irregular walls help to avoid a wrong diagnosis (Fig. 9).

Small urethrocavernous refluxes sometimes appear in the lower wall in the same region of the cavernous urethra in close proximity to the urethral lumen. The urethral border of the reflux has a smooth contour without any visible communications although the outline against the cavernous tissue is diffuse. Sometimes the reflux may show an extension similar to an irregular filling of the bulbourethral duct (Fig. 10). As a sequel of large refluxes in the bulb, narrow paraurethral cavities with

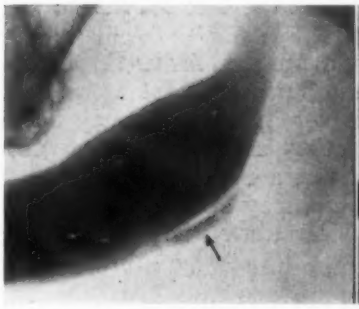

Fig. 8. Right oblique view. Incomplete contrast-filling of the left bulbourethral duct (arrow). Broad communication between duct and urethra. Slightly irregular contours.

Fig. 9. Right oblique view. Inferior surface of the cavernous urethra; an irregular paraurethral cavity, being a part of a temporarily closed fistula system. Stricture of urethra.

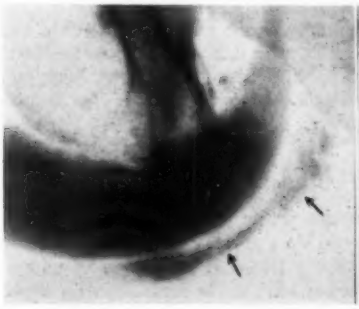

Fig. 10. Right oblique view. Inferior surface of the cavernous urethra: urethrocavernous reflux (arrows).

Fig. 11. Left oblique view. Inferior surface of the posterior part of the cavernous urethra: contrast-filled paraurethral cavity of slightly irregular outline (arrow). On urethrocystography two years previously, urethrocavernous reflux and contrast-filling of the entire bulb of the corpus cavernosum urethrae.

irregular contours may appear. The site may cause confusion with a diverticulum (Fig. 11).

False passages in this region must also not be forgotten. There is generally a history of external violence with haematuria or bleeding during transurethral intervention. The false passage is demonstrated as

an irregular ramification or bulging from the urethral shadow, in visible communication with the urethra.

When high viscosity contrast media are used for urethrography, what appear to be fine contrast defects are often seen in the urethra (MORALES and ROMANUS 1952). If this fact is not known they may be misinterpreted as diverticula. When present they are found in the wide bulbar portion of the urethra where diverticula are most common.

Skin contours, overlapping the bulb, may also resemble fine contrast defects in the urethra. Such contours can always be followed outside the urethral lumen.

SUMMARY

The roentgenologic findings in diverticula of the male cavernous urethra are described. Diverticula of the posterior part of cavernous urethra are not rare although very uncommon in the anterior part. The investigation supports the theory that the former are due to cyst formation of the bulbourethral ducts.

ZUSAMMENFASSUNG

Die Röntgenbefunde bei Divertikeln der männlichen Harnröhre werden beschrieben. Die Divertikel des hinteren Abschnittes der Pars cavernosa urethrae sind nicht selten, obwohl sie im vorderen Abschnitt sehr ungewöhnlich sind. Die Untersuchung bestätigt die Theorie, dass die Divertikel des hinteren Abschnittes auf Grund einer zystischen Umwandlung der bulbourethralen Gänge enstehen.

RÉSUMÉ

L'auteur décrit les signes radiologiques des diverticules de l'urètre spongieux masculin. Les diverticules de la partie postérieure de l'urètre spongieux ne sont pas rares, alors que ceux de la partie antérieure sont exceptionnels. L'examen vient à l'appui de la théorie selon laquelle les premiers proviendraient de la formation de kystes sur les canaux bulbo-urétraux.

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FROM THE ROENTGEN DIAGNOSTIC DEPARTMENT (DIRECTOR: PROFESSOR OLLE OLSSON)
OF THE UNIVERSITY CLINICS OF LUND, SWEDEN

VERTEBRAL ANGIOGRAPHY IN CEREBELLAR HAEMANGIOMA

by

Olle Olsson

In his classical monograph 'Studien über Kleinhirncysten' LINDAU (1926) describes the anatomic characteristics of haemangioma of the cerebellum, as seen in 16 personal cases. These tumours, which are as a rule small and well-outlined, are localized to the cortical or subcortical layer of the ventral or dorsal part of the cerebellum. The cerebellar tonsils are the commonest site of the tumours which are never found in the anteromedial region of the cerebellum. In most of LINDAU's cases the tumour mass was situated adjacent to the outer wall of the cyst. In one case, however, the cyst had developed within the actual vascular growth so that the former was entirely encompassed by a ring of richly vascularized tumour tissue.

Tumours of this type are rarely multiple in the central nervous system, where they occur in the cerebellum and spinal cord. If they arise in the medulla oblongata, the dorso-caudal region is the site of election. It is generally believed that the lesions are never seen in the cerebrum, but ROCHAT has described a case of multiple haemangiomata in which one of the growths was situated in the cerebrum.

The tumour is composed of cells, which form vessels ranging from small capillaries to large cavernous spaces (TÖNNIS, 1936). These formations may be demonstrated by vertebral angiography. Hitherto the diagnosis of LINDAU's tumour angioma by this method has been reported only by LINDGREN (1950) who, in a paper on his method of percutaneous vertebral angiography, described two cases of cerebellar angioma, and by RADNER (1951) whose cases are included in the present series. An analysis of the roentgenographic appearances of such tumours in patients submitted to vertebral angiography in our department is now reported.

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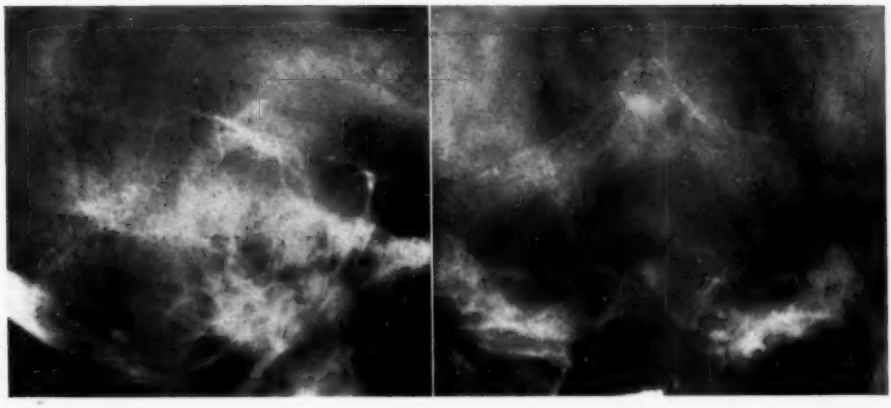


a. b.

Fig. 1. Case 1. The angioma appears as a homogeneous formation measuring 6 mm × 4 mm and is situated superficially in the midline in the inferior part of the posterior fossa.

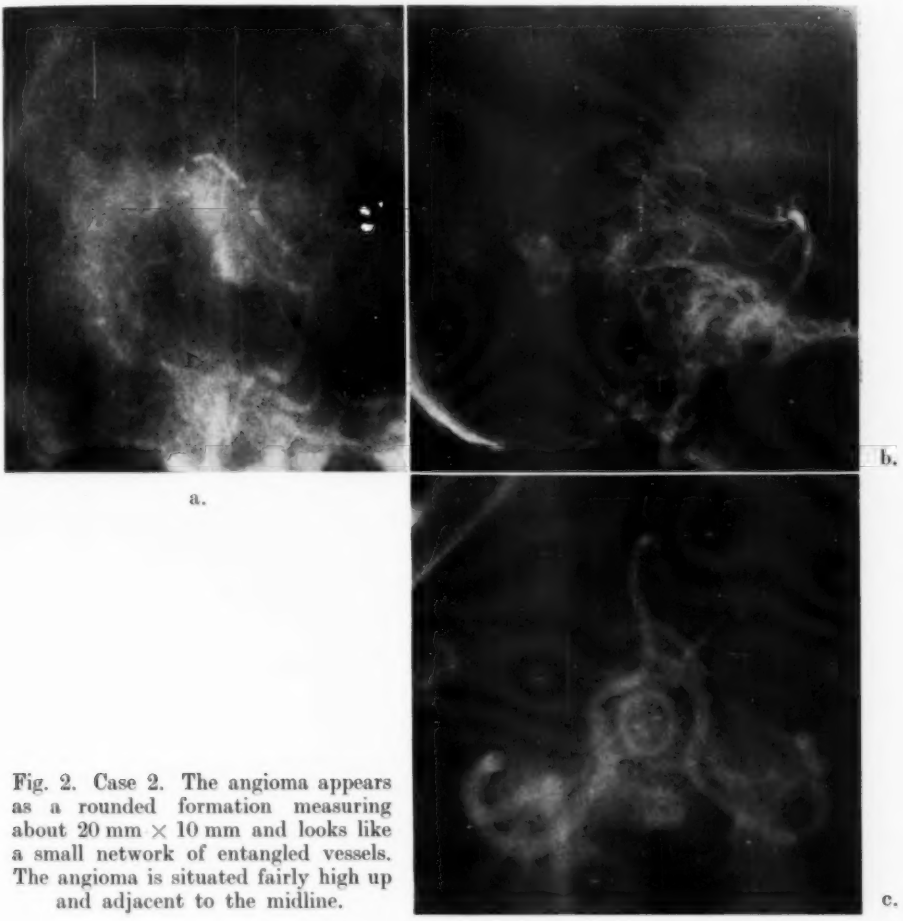
Since the introduction of vertebral angiography 8 patients have been operated on for haemangioma of the cerebellum at the Neurosurgical Department. Of the 7 cases reported below, 6 were operated on (by Dr. LUNDBERG). All were submitted to vertebral angiography by catheterization. In one case, in which catheterization failed on one side, no attempts were made to catheterize the artery on the other side; pneumography was performed instead.

Case Reports

Case 1. E. A. 123/48. Male, aged 63, with a two years' history. *Vertebral angiography:* The basilar artery was situated to the left of the midline. A filling was obtained of a pea-sized vascular tumour situated in the midline and on a level with the posterior fossa. No other vascular displacement was seen (Fig. 1 a & b).

Three weeks later the patient died. *Postmortem examination:* A pea-sized reddish brown tumour was seen to the right of the midline at the base of the cerebellum. A cyst of the size of a hen's egg filled the whole of the right lobe and a large part of the left lobe. The entire cyst wall consisted of angiomatous tissue. Microscopic examination: The cerebellar tumour was composed of numerous, partly blood-filled capillaries. *Diagnosis:* Angioreticuloma with large cystic formation in the right hemisphere of the cerebellum.

Case 2. H. O. 342/48. Male, aged 45, with one year's history. *Ophthalmologic examination:* Papilloedema. *Vertebral angiography:* Via the left superior cerebellar artery contrast filling was obtained of a 2 × 1 × 1 cm vascular tumour adjacent to the midline and immediately posterior to the middle of the posterior fossa. Just anterior to the tumour the posterior cerebellar arteries showed a moderate degree of upward displacement (Fig. 2 a, b & c). *Operation:* An incision 4 cm deep into the right hemisphere

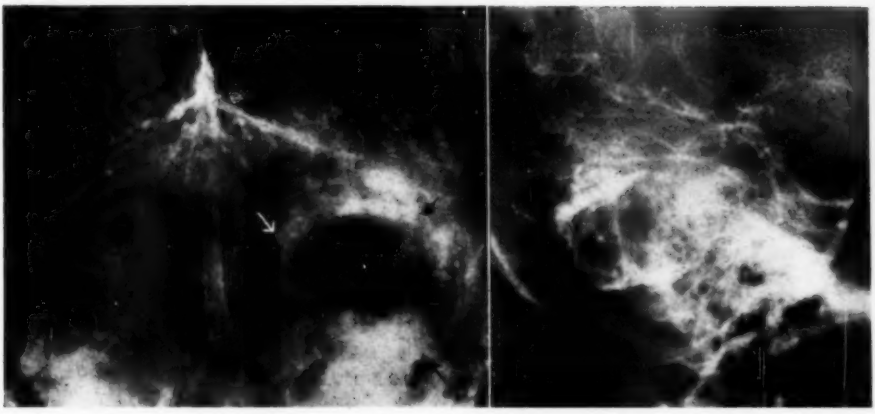


a. b. c.

Fig. 2. Case 2. The angioma appears as a rounded formation measuring about 20 mm × 10 mm and looks like a small network of entangled vessels. The angioma is situated fairly high up and adjacent to the midline.

revealed a small cyst and a typical Lindau tumour near the incisura tentorii. Medial to the tumour was a large cyst, situated high up against the incisura tentorii.

Case 3. G. P. 371/49. Male, aged 45, with a two months' history. *Vertebral angiography:* The left superior cerebellar artery ran somewhat higher than the right. No other signs of a pathologic condition were seen. No filling of an angioma was obtained. *Ventriculography:* Considerable symmetric widening of the ventricular system. The aquaeduct was kinked supratentorially. The fourth ventricle was displaced to the right. Expansive process in the left cerebellar hemisphere. *Operation* revealed a haemangioma of the cerebellum with cyst.



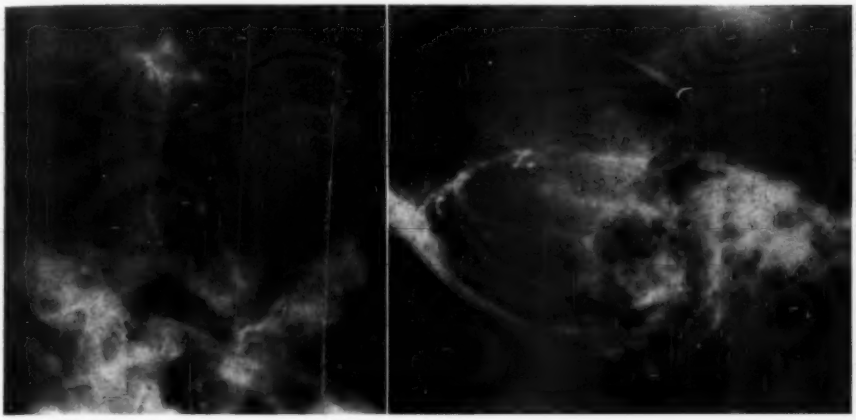
a. b.

Fig. 3. Case 5. The angioma appears as tortuous vessels in a 2—5 mm wide ring of somewhat varying thickness and 5 cm in diameter. The angioma lines the cyst, which occupies the major part of the left cerebellar hemisphere. Anatomically the tumour is of the same type as Lindau's case 8.

Case 4. D. L. 476/49. Male, aged 53, with a two years' history. *Ophthalmologic examination:* Slight papilloedema. *Vertebral angiography:* At the bottom of the posterior fossa slightly lateral to the middle of its right half, a filling was obtained of a vascular tumour barely 2 cm long and 1 cm in diameter. The right superior cerebellar artery ran higher than the left and the basilar artery was situated slightly to the left of the midline. *Operation:* Incision of the lateral part of the right hemisphere of the cerebellum; a cyst situated a few centimeters deep in the anterior upper lateral part of the hemisphere and about the size of a golf ball, was found. In the lateral wall was a hazelnut-sized angioma.

Case 5. H. N. 56/51. Male, aged 36, with a two years' history. *Ophthalmologic examination:* Pronounced papilloedema with small punctate haemorrhages. *Vertebral angiography:* The basilar artery was situated slightly to the right, and the basal part of the posterior cerebellar artery on the left side was a little flattened. To the left of, and in immediate contact with the left posterior cerebellar artery a network of vessels in a ring 2—5 mm wide and 5 cm in diameter was noted. The ring was irregular and contained in its upper part a sac-shaped formation, 1 cm in diameter into which a somewhat widened artery entered. (Fig. 3 a & b.) *Diagnosis:* Angioma lining a cystic formation in the left hemisphere of the cerebellum. The cyst was punctured and the patient received roentgen therapy. Further vertebral angiograms were carried out three and a half months later and showed a moderate decrease in the size of the cyst and in the number and size of the vessels in the cystic wall. *Operation:* The cystic wall was richly vascularized, partly with arterialized veins. Near the anterior pole of the cyst was a mass of entangled, thin-walled vessels.

Case 6. U. M. 235/51. Female, aged 23, with a two months' history. *Ophthalmologic examination:* Papilloedema, small streaky haemorrhages. *Vertebral angiography:*



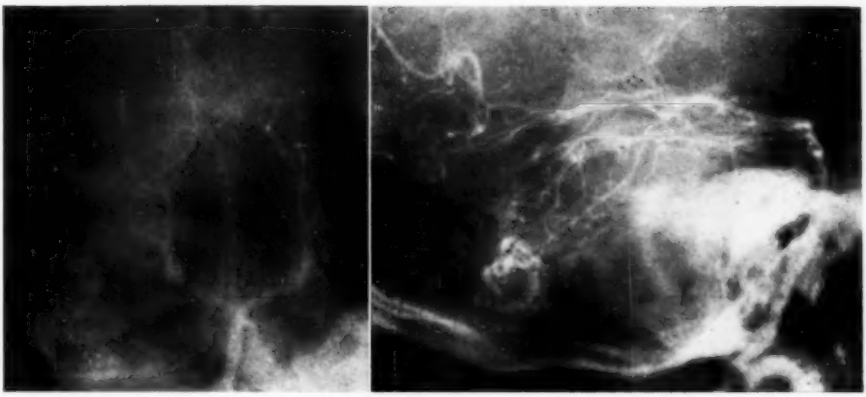
a. b.

Fig. 4. Case 6. Multiple angiomas, one of which lies immediately to the left of the midline superficially in the posterior fossa. The other is situated dorsally in the superficial part of the medulla oblongata.

The basilar artery ran an oblique course with its upper part to the left. The left posterior cerebral artery was much more horizontal than the right. The vascular pattern was irregular. In the left part of the posterior fossa, far down near the border of the foramen magnum, a sac-shaped formation about 50 mm in diameter was seen — angioma. More distal and on the right side was a similar, slightly smaller formation. (Fig. 4 a & b.) *Operation:* An angioma was extirpated from the medulla oblongata. It was situated slightly to the right of the midline at the site of the nuclei of the posterior funicles. At the first operation, only one angioma was detected. After operation the patient improved, but two years later again complained of headache, blurred vision and giddiness. Further vertebral angiography showed the same angioma to the left of the foramen magnum as at the previous examination. On reviewing the films from the first examination another angioma situated in the dorsal part of the medulla oblongata, was detected.

The patient was referred to the radiotherapeutic department for treatment.

Case 7. A. N. 409/51. Male, aged 42, with five months' history. *Ophthalmologic examination:* The right papilla was protruded and pale, the left very pale but not protruded. *Vertebral angiography:* The basilar artery and the posterior cerebral artery were slightly displaced to the right. The left superior cerebellar artery was moderately displaced towards the midline in that section immediately distal to its large bend. Far back and near the surface was an area about 2 cm in diameter with very irregular, tortuous, varying sized vessels lying in the midline of the bottom of the posterior fossa. A few slightly widened arterial branches entered this formation. (Fig. 5 a & b.) *Operation:* Immediately adjacent to the vermis just below the inion was a chestnut-sized angioma, situated near the surface. Below it a cyst containing a clear fluid occupied the upper medial part of the hemisphere and was opened.



a. b.

Fig. 5. Case 7. The angioma lies inferiorly in the midline and has the appearance of a small network of entangled vessels.

Discussion

Of the 7 cases of haemangioma of the cerebellum in which vertebral angiography was performed, a filling of the growth was obtained in six, while no pathologic changes were seen in one.

In three of the cases the angioma was of one and the same size and shape. It appeared in the angiogram as a rounded formation about 2 cm in length and 1 cm in diameter. It was not homogeneous and looked like a small network of entangled vessels of varying size (Fig. 2).

In one case the angioma appeared as a homogeneous formation measuring 6 × 4 mm (Fig. 1).

In Case 6 (Fig. 4) angiography revealed a pronounced, vascular abnormality and the presence of two angiomas, one in the left hemisphere of the cerebellum, the other in the dorsal part of the medulla oblongata. This case is an example of multiple angiomata of the central nervous system described by LINDAU.

In one case (5), the angioma appeared as tortuous vessels in a ring 2—5 mm wide of somewhat varying thickness and 5 cm in diameter (Fig. 3). This case corresponds in type to LINDAU's case 8, in which the cyst was formed in the actual angioma and in which the entire cystic wall thus consisted of angiomatous tissue.

Situation of the tumour: In four of the cases the tumours were situated in the posterior fossa near the foramen magnum; in three of these it was

near the midline, while in one it was situated laterally. These four cases include the case with multiple angiomata with one of the lesions in the dorsal part of the medulla oblongata. In one of the cases the angioma was situated high up and far back near the surface of the cerebellum under the tentorium immediately to the left of the midline. In another case, in which the cyst had formed in the actual angioma, a large part of the left hemisphere was occupied by the tumour, the lateral part of which reached the surface.

Angiographic appearance of haemangioma of the cerebellum: In one of the cases the angioma was seen contrast-filled only in the arterial phase of the angiography, while in the other cases the tumour was visualized also in the venous phase. It is often more distinct in a late angiogram of the series, because by then the concentration of the contrast medium in the superimposed arteries has had time to diminish.

It should be mentioned that the vascular displacement is extremely slight, even in the presence of large cysts.

It is thus evident that the angiographic appearance of a haemangioma of the cerebellum is characteristic. The present series represents all the different types of haemangiomata described in the patho-anatomic literature. In the investigation of these tumours vertebral angiography is clearly indicated and is frequently, though perhaps not in every case, informative.

SUMMARY

Seven cases of haemangioma of the cerebellum were investigated by vertebral angiography, and in six of these the tumour was visualized. The roentgen diagnosis of these tumours, based upon LINDAU's patho-anatomic description, is discussed.

ZUSAMMENFASSUNG

Sieben Fälle von Kleinhirnhaemangiomen wurden mit Hilfe der Vertebralisangiographie untersucht; in sechs dieser Fälle konnte der Tumor dargestellt werden. Die Röntgendiagnose dieser Tumoren, die sich auf LINDAU's pathologisch-anatomische Beschreibung stützt, wird besprochen.

RÉSUMÉ

Sept cas d'hémangiome du cervelet ont été examinés par angiographie vertébrale et dans six de ces cas la tumeur a été visualisée. L'auteur étudie le diagnostic radiologique de ces tumeurs, basé sur la description anatomo-pathologique de LINDAU.

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FROM THE DEPARTMENT OF ROENTGENOLOGY AND RADIOTHERAPY (DIRECTOR: PROFESSOR M. SMOKVINA), THE DEPARTMENT OF MEDICINE (DIRECTOR: PROFESSOR J. H. BOTTERI), THE DEPARTMENT OF PEDIATRICS (DIRECTOR: PROFESSOR N. SKRIVANELI), AND THE DEPARTMENT OF SURGERY (DIRECTOR: PROFESSOR J. BUDISAVLJEVIĆ) OF THE MEDICAL SCHOOL OF THE UNIVERSITY OF ZAGREB, ZAGREB, YUGOSLAVIA

PERCUTANEOUS SPLENIC VENOGRAPHY

by

V. Gvozdanović, E. Hauptmann, E. Najman and *B. Oberhofer*

Introduction

Portal hypertension with concomitant varicosities in the oesophagus and gastro-intestinal tract has a rather unfavourable prognosis. According to various statistics (SNELL, PATEK), 20—50 per cent of such cases die within a year of the initial haemorrhage. By the introduction of operative therapy (splenectomy, porto-caval and spleno-renal anastomoses) a possibility of the relief of the condition has been created.

The surgery of portal hypertension depends on the aetiology, and it is of importance for the operator to be pre-informed as to the site of the disturbance in the circulation. The difficulty of establishing the actual lesion even at operation is evident from WHIPPLE's records; this author performed 316 splenectomies, and when thrombosis was present, it was found impossible in over 50 per cent of cases to localize the obstruction.

History

For the purpose of localizing the obstruction in the portal circulation, BLAKEMORE, LORD and WHIPPLE (1945) injected Diodrast 35 % into one branch of the portal vein at operation. This method has been modified by MOORE and BRIDENBAUGH (1950) who injected the contrast medium through a catheter introduced into the right gastro-epiploic vein, while CHILD and his co-workers (1951) succeeded in obtaining good

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venograms by direct injection of the contrast medium into the superior mesenteric vein. All these modifications have the drawback in that the direct puncture of the aforementioned veins is not feasible except during laparotomy.

FARIÑAS, in 1947, demonstrated the portal circulation by injecting a contrast substance into the femoral vein in a case in which porto-caval anastomosis had been carried out. DOTTER and co-workers (1950) examined the function of a performed porto-caval anastomosis by injecting a 75 % contrast medium through a catheter introduced by way of the saphenous vein into the portal vein.

ABEATICI and CAMPI (1951) were the first to publish an experimental study of the possibility of representing the portal system in the dog by means of the percutaneous injection of a contrast medium into the spleen.

In March 1952, DREYER and BUDTZ-OLSEN reported the first venographies performed in man by the percutaneous injection of Diodone 70 % into the spleen. It would appear from the available literature, that the method has aroused little interest although it would seem to present considerable advantages as compared with direct portal venography. During the last six months we have had the opportunity of applying the method in fourteen cases which are now reported; certain modifications of the original method are described.

Technique

One day prior to the examination the patient is tested for sensitivity to iodine, 1 ml of Joduron 30 % being injected intravenously. The patient is given 0.02 of morphine half an hour before the examination which is carried out on a roentgen couch provided with a home-made device for speedy film changing (G). The patient lies supine. Before the puncture is made, a preliminary film of the abdomen should be taken so that the roentgenographic factors may be accurately assessed. The skin, subcutaneous tissue, muscular layer and parietal pleura in the 8th, 9th or 10th intercostal space in the anterior axillary line are then anaesthetized by means of a 1 % solution of novocain. When the point of the needle reaches the surface of the spleen, it will be felt to scrape against the capsule, and in this way the distance of the spleen from the surface of the chest wall is measured. A lumbar-puncture needle with an internal diameter of 2 mm is now directed through the chest wall as far as the splenic capsule. A syringe containing 20 ccm of Joduron 70 % is attached to the needle and the patient instructed to take a deep breath and hold it. The spleen is now punctured to a depth of about 3—5 cm, depending on the thickness of the organ, in the direction of the hilus, and the contrast medium is injected within 3—5 seconds. After the in-

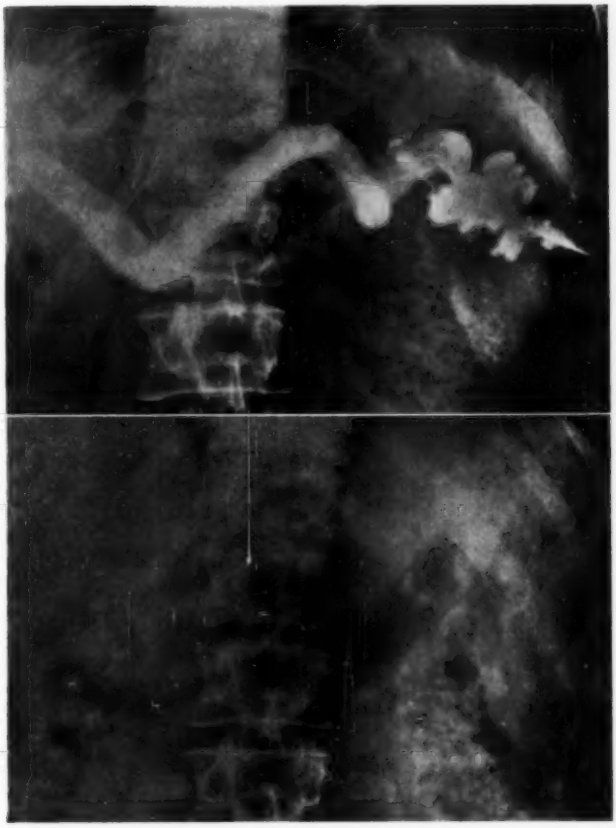


Fig. 1. Above. Normal percutaneous splenic venography. Representation of the V. lienalis and V. porta and its tributaries. No appreciable weakening of the contrast shadow at site of entry of the inferior mesenteric vein. No collaterals present. Puncture made very deeply and obliquely; insignificant reflux through the puncture canal sub-capsularly. Below. One hour after the injection, practically all the medium has left the spleen, no contrast subcapsularly. The dye is excreted through the kidneys.

jection the needle is immediately withdrawn. The first roentgenograph is obtained after 10 ml of the medium has been injected, the second towards the end of the injection, the third after its completion, and the fourth 2—3 seconds later. The roentgenographic factors are: 75 kV, 120 mA, 80 cm distance, with a time of about 0.5 sec; a Lysholm grid

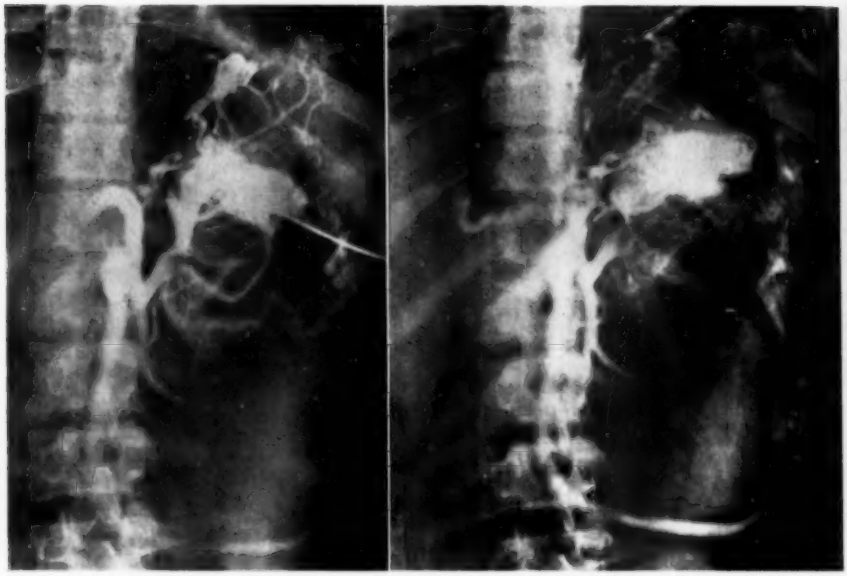


Fig. 2 a. 2 b.

2 c.

Fig. 2. a. Obstruction of the V. lienalis due to thrombosis. Strong collateral circulation in the direction of the capsule, cardia and inferior mesenteric vein. b. Toward the end of the injection, 2 seconds after the first exposure, the collateral circulation is better visualized. The inferior mesenteric vein is displaced medially and downwards. Enlarged sinusoidal veins may be seen in the capsule. c. Fifteen minutes after injection, only a number of spots seen in the spleen.

Fig. 3 a. Vv. lienalis and porta are quite patent. Veins, enlarged owing to varicosities medially from the hilus of the spleen in the region of the body of the stomach, are filled from the Vv. gastricae breves.

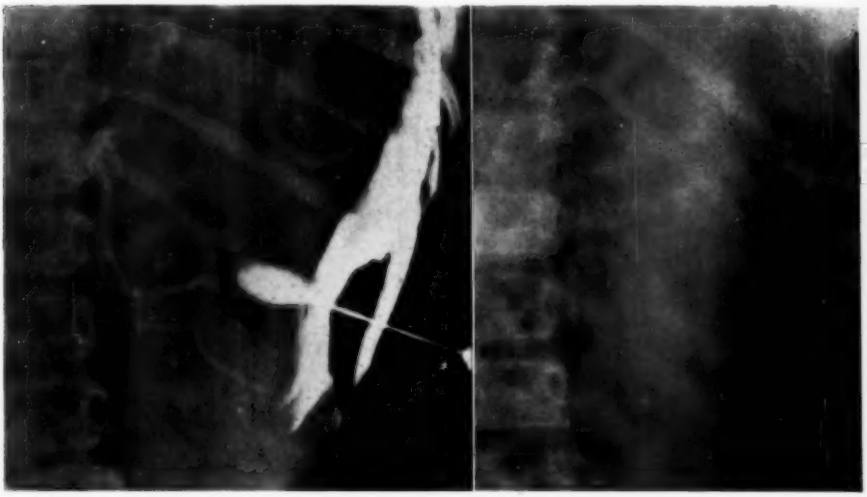
Fig. 3 b. Direct portal venography performed at operation by injecting medium into the upper mesenteric vein here gives the same finding as percutaneous splenic venography.

and rotating anode tube are used. The patient remains on the roentgen couch for one hour following the procedure. During this time two control exposures are made, the first 15 and the second 60 minutes after the injection. The patient is then returned to the ward, and remains in bed until the next morning.

Of fourteen percutaneous splenic venographies, nine were performed by the technique above described and five by the trans-abdominal puncture method; this latter we have, for various reasons, now abandoned.

Results

Fourteen percutaneous splenic venographies were performed in thirteen patients, of which four were children. The findings were normal (Figs. 1 a—b) in nine cases, of which three were corroborated operatively. There were two cases with varicosities in the oesophagus and



a. b.

Fig. 4. a. Technically an unsuccessful puncture. The canal is too short and a strong reflux has occurred sub-capsularly and peri-splenically. Filling defect in the hilus of the spleen.

b. Two hours later the dye is absorbed.

cardiac part of the stomach, but without disturbances of the splenic or pre-hepatic circulation. Both cases were verified at subsequent operations. In one case of thrombosis of the splenic vein we succeeded in defining the actual site of the obstruction as well as an extensive network of collaterals (Figs. 2 a—b). The latter case was also corroborated by operation. In three cases a check-up was performed by direct portal venography at operation, twice by means of injection into the superior mesenteric and once into the splenic vein. In all the cases, the direct venographic findings corresponded to those obtained by percutaneous venography (Figs. 3 a—b, 4 c—d). By tracing the circulation of the contrast medium in serial films, we were able to establish that the medium was leaving the spleen only for as long as there was an elevated pressure in that part of the parenchyma into which the injection was being made. After completion of the injection, the medium no longer enters the portal circulation in any radiographically demonstrable quantity. The contrast medium remaining within the parenchyma at the site of the injection disappears almost entirely within one hour (Fig. 1 b). If the dye is injected into a poorly vascularized part of the spleen, as for example

c. d.

Fig. 4. c. Further puncture a fortnight later. The canal is long, the medium being injected near the hilus: no reflux. Contrast medium runs in broad veins into the region of the cardia, where they are seen to be enlarged and tortuous. Filling defect at the hilus.

d. Direct venography performed at operation by injecting medium into the superior mesenteric vein. The findings correspond to those obtained by percutaneous venography (Fig. 4 c): filling defect at the hilus; veins changed due to varicosities in the region of the stomach, especially at the cardia, with broad veins in the oesophagus and atypical configuration of Vv. lienalis and porta. Finding at operation: cavernomatous malformation of the V. porta, the circulation being carried out by the veins of the oesophagus; thrombus at the hilus of the spleen.

into an area of infarction in chronic myelosis, it will remain there much longer and only slowly pass into the splenic vein.

Provided the puncture technique is satisfactory and the injection of the contrast medium effected speedily enough, the splenic vein as well as the vena porta and its tributaries are clearly seen on the film.

We have not been able to establish a more pronounced dilution of the contrast medium at the site where the large venous tributaries drain the non-contrast blood from the abdomen. Of the patients in whom splenic venographies had been performed, five were operated on within 7—20 days after examination. In no case was it possible to establish injury to the capsule or parenchyma in the punctured area, while the ac-

tual site of puncture was found in only two cases. We did not find any gross signs of inflammatory changes within the parenchyma or on the surface of the spleen.

Complications

In none of our fourteen cases have we been able to observe complications of a more serious nature in connection with percutaneous splenic venography. In two cases, a rather extensive reflux of the contrast medium along the puncture canal under the capsule and perisplenically, occurred (Fig. 4 a). A control film made one hour later showed complete absorption of the medium (Fig. 4 b). In both these cases the concentration of the contrast medium in the splenic vein was very poor. In one case the stomach, distended by a large quantity of air, had displaced the spleen caudalwards. For this reason the puncture needle passed through the upper part of the relatively thin and long spleen and entered the stomach; in spite of this there were no untoward sequelae.

We do not consider the method, however, to be without its dangers. From experiences in 180 cases of punctured spleens, MOESCHLIN is of the opinion that chronic infection as well as a haemorrhagic diathesis are to be considered contraindications for this procedure on account of the possible occurrence of bleeding into the abdominal cavity. In our 105 diagnostic spleen punctures, we had one fatality due to rupture of the capsule with subsequent exsanguination.

Indications

Splenomegaly of obscure aetiology and suspected obstruction in the portal circulation is in our opinion always an indication for the utilization of this method.

Discussion

In reviewing percutaneous splenic venographies we have gained the impression that success is largely dependent on the puncture technique. We consider it most important to make the puncture obliquely and deeply in the direction of the hilus, so that the puncture canal may be as long as possible. In this way a reflux of the dye sub-capsularly and perisplenically is avoided. In addition, the contrast medium will be much more concentrated if it is injected near the hilus, because its transport is more rapid owing to the distance to be covered being shorter. As to the size of the puncture needle and the pressure under which injection of the contrast medium is performed, we have chosen a middle course. Although in other fields of angiography it is advisable that the rate of injection of the contrast medium be speeded up so as to attain a high

concentration of the substance in the blood, we cannot apply this rule without certain reservations in percutaneous splenic venography. As in this procedure, the injection of the medium is not carried out directly into the vessel but into the parenchyma of an organ, the possibility of ensuing complications (reflux along the puncture canal, injury to the capsule, haemorrhage) increases in proportion to the diameter of the needle as well as to the amount of pressure. From our experiences so far, we have been able to achieve the best results by using a puncture needle with an internal diameter of 2 mms and an injection rate of about 6 cc per sec.

In accordance with what has been said above, we are of the opinion that the process of passage of the contrast medium from the spleen into the splenic vein is predominantly of a passive nature, and that active splenic contraction, which ABEATICI and CAMPI have established in the dog, does not play an essential rôle in man.

Serial exposures are imperative if we are to avoid errors in interpreting the findings in percutaneous splenic venography. Thus, for instance, the discovery of the contrast medium only in the initial portion of the splenic vein with the appearance of collaterals need not constitute evidence of the circulation being obstructed, if only one exposure has been made. In such cases it may well be that the 'head of the contrast column' has not yet reached the vena porta and its branches at the moment of exposure, while the development of extensive collaterals may also be a consequence of portal hypertension brought about by intra- or post-hepatic factors (cirrhosis, for instance). Only by successive tracing in a series of films of the contrast medium passing through the v. lienalis and v. porta, can we localize the obstruction in the circulation with certainty.

We were unable to corroborate the statement made by DREYER and BUDTZ-OLSEN that in normal cases a dilution of the contrast medium occurs at the site of the entry of the superior mesenteric vein owing to an inflow of non-contrast blood producing a fallacious impression of a 'filling defect'. We have been unable to establish this phenomenon in any of our cases.

SUMMARY

In cases of portal hypertension with concomitant splenomegaly as well as in cases suggestive of thrombosis of the splenic vein, the authors have employed percutaneous splenic venography (DREYER and BUDTZ-OLSEN) for the purpose of establishing disturbances in the circulation, and report a material consisting of fourteen cases. The details of the technique are described. The results were satisfactory and there were no major complications connected with the procedure. A modification of the original method by employing serial roentgenography has proved to be of considerable value.

ZUSAMMENFASSUNG

In Fällen von portaler Hypertension mit gleichzeitiger Splenomegalie sowie in Fällen, die an eine Thrombose der V. lienalis verdächtig waren, haben die Verf. zur Feststellung von Zirkulationsstörungen die perkutane Milzvenographie (DREYER und BUDTZ-OLSEN) benutz und geben über ihr aus 14 Fällen bestehendes Material Bericht ab. Technische Einzelheiten werden beschrieben. Die Ergebnisse waren zufriedenstellend; keine grösseren Komplikationen waren mit der Methode verbunden. Eine Modifikation der Originalmethode unter Anwendung der Serienröntgenographie erwies sich von beträchtlichem Wert.

RÉSUMÉ

Les auteurs ont utilisé, dans des cas d'hypertension portale avec splénomégalie concomitante et dans des cas de thrombose probable de la veine splénique, la phlébographie splénique percutanée (DREYER et BUDTZ-OLSEN) pour mettre en évidence les troubles de la circulation et en présentent quatorze cas. Ils décrivent les détails techniques. Les résultats ont été satisfaisants et il n'y a pas eu de grosses complications dues à la méthode. Une modification de la méthode originale, consistant en l'emploi de la radiographie en série, s'est montré d'une valeur considérable.

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FROM THE ROENTGEN DIAGNOSTIC DEPARTMENT (DIRECTOR: PROFESSOR K. LINDBLOM), KAROLINSKA SJUKHUSET, STOCKHOLM, SWEDEN

A SIMPLE CENTERING DEVICE FOR RADIOGRAPHIC TUBES

by

Ove Mattsson

The centering of a roentgen tube for radiography requires a simple and accurate localizing device. The one most frequently used consists of a telescopic metal pointer attached to a bracket on the diaphragm frame and which must be turned aside before the exposure. Apart from requiring an excessive amount of manipulation and being insufficiently precise, the pointer usually has a sharpened extremity which may prove a potential cause of injury to patients or operators, especially in the dark. Children are also easily frightened by it. Localizing cones, employed in some departments, are inconvenient to use and produce inaccurate results.

The idea of using an optical system, with its obvious advantages, is by no means recent. Such systems have been employed primarily for indicating the picture field outlined by the primary diaphragm. Designs by RUDOLF MANNL dating from 1931 and 1932 defined the surface exposed to radiation by means of illumination from a mirror and an auxiliary lamp arranged in a special manner. Another and later development was the familiar Siemens diaphragm — designed by GUND in 1938 — which indicated the outline of the field by means of projected bands of light. This construction was combined with a multiple-plane diaphragm. An optical system not unlike that of MANNL's was designed by BAIER in 1939. An apparatus with a mirror, constructed by PORCHER and CHAUSSÉ (1944), had a movable lamp as well as a lens. The bundle of visible light could thus be varied. There exist American constructions which employ the optical principle, and a device using a mirror system was recently marketed by Philips Ltd. It is also appropriate to mention

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the devices developed for the Swedish Army radiographic units, designed by MAGNI. Optical aiming systems, as used for therapy, will not be discussed here.

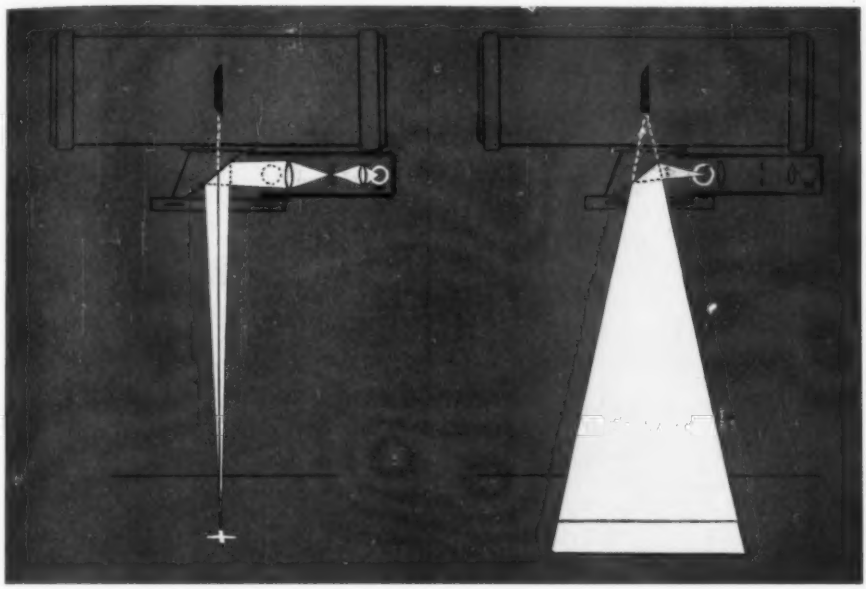
(The apparatus by R. MANNL (Karlsbad) was patented in Germany — D.R.P. 578,592 and D.R.P. 597,897 of April 21, 1931 and August 28, 1932. U.S.P. 1,976,179. B.P. 372,542 and Sw.P. 81,066 all correspond to the invention by MANNL. The diaphragm invented by K. GUND was patented in Sweden — Sw.P. 104,375 — with validity from April 19, 1938. The design of A. BAIER (Munich) corresponds to the U.S.P. 2,204,465 and Fr.P. 849,802, March 3, 1949. The apparatus designed by PORCHER and CHAUSSÉ in France represents the Fr.P. 903,085, March 29, 1944.)

The majority of devices mentioned — often combined with multiple-plane diaphragms — are large and bulky. They are mostly used for special purposes, such as with horizontal tables for skeletal radiography, for angiographies, etc. It is a well-known fact that many of these arrangements require a considerable amount of servicing.

A simple, compact and accurate optical aiming device for most of the roentgen tubes fitted with a telescopic pointer and combined with any of the usual single-plane diaphragms, has long been a desideratum.

The dominating requirement has been an indication of the direction of the central ray. Most operators are familiar with the metal pointer, and standard adjustments are usually made by levelling the central ray in relation to certain recognized anatomical landmarks. When repeated and identical exposures have to be made, it is also simplest to consider the central ray. Mention should here be made of a design in which the bracket attachment has a small tubular torch light in place of the metal pointer and which produces a spot of light, *i. e.* a type of optical central-ray indicator; the whole arrangement incorporating most of the disadvantages of the telescopic metal pointer.

The arrangement to be described projects light in the shape of a cross or other suitable figure by means of an optical system on to the centre of the picture field. The system is similar to that of a lantern-slide projector and is focussed at a level corresponding to the surface of an ordinary radiographic object. Fig. 1 shows the path of the rays. A mirror arrangement makes the central ray in the projection coincide exactly with the central ray of the roentgen tube; accuracy is obtained in every position, and the field is not obstructed in any way. The mirror is made of thin glass or other suitable material with a coating, a few μ thick, of aluminium, the total roentgen ray absorption factor being extremely low and very much less than that of the front of a cassette. The mirror is placed obliquely between the roentgen tube and the diaphragm holder and is supported by the connecting cylinder or cone. Its centre coincides with the central ray of the tube, and the surface of the mirror is at an angle of 45° with the central ray. A ray of visible light falls upon the mirror from



a. b.

Fig. 1. a. The path of the rays. From the right: lamp, condenser lens, metal mask with a cut-out cross, projection lens, mirror and, above the latter, the radiographic focus. b. A special lamp is introduced in the position where it gives a correct picture field marking, as its conical bundle of rays coincides with that of the tube.

the side and is produced by the projecting system, consisting of the projection lens, the condenser and the filament lamp. A small metal mask is placed in a suitable position between the lens and the condenser, with perforations corresponding to the adjustment pattern.

The figure is projected by the lens and the necessary coincidence with the central ray of the roentgen tube is thus produced by reflection. Fig. 1 shows, from the left: the lamp, condenser, mask, lens, mirror, and above the latter the radiographic focus. The advantage of a projection system lies partly in the gain made in illumination intensity and partly in the very good definition of the indicating image.

A general requirement is that a positioning device should give an indication of the limits of the picture field: *i. e.* width of the beam of rays, as observed at the level of the skin of the patient. This is of less importance when a constant tube distance and fixed diaphragms are used, the outline of the field of radiation then being a matter of experience. When variable diaphragms are employed, however, indication of the extent of

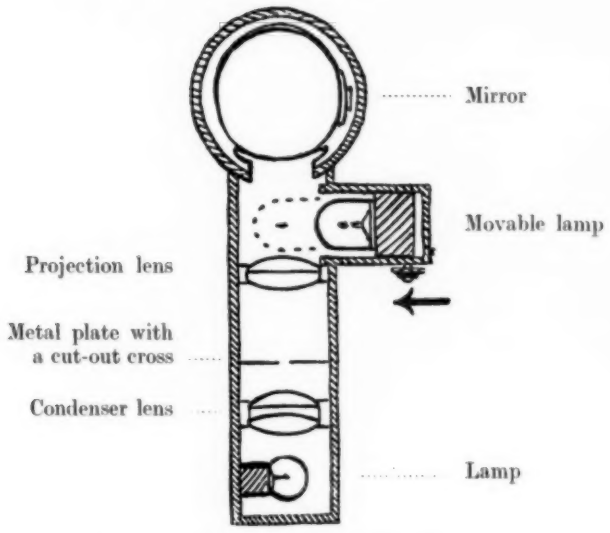


Fig. 2. General arrangement of the apparatus.

the field is of great value. To make this possible, a device was introduced consisting of a special lamp with a very small filament, the diameter of which was approximately 1.5 mm or about the size of an ordinary tube focus (Fig. 1b). This lamp may be introduced into the optical system in a position in which — via the mirror — it produces a beam of light which coincides completely with, and has the same conical spread as, the roentgen radiation. The distance between the centre of the mirror and the lamp must equal the distance from the same spot on the mirror to the focus. Exact coincidence in radiation will then be produced for any distance, and the limits of the field of radiation are immediately indicated by the illuminated surface. By the mere pressing of a button, the apparatus is switched over from central ray indication to field indication and simultaneously the small lamp slides into the correct position. Fig. 2 shows the simplicity of the apparatus. It is seen from the side towards which the roentgen rays are directed. The mirror, which is elliptical, appears circular because of its oblique position when seen along the direction of the rays. The tubular housing of the apparatus has an extension for the field indicator lamp, which is easily accessible and can be brought into position by pressing the button. As it changes position, it acts on a small switch which closes the electric circuit, and which at the same time makes the other optical system inactive.

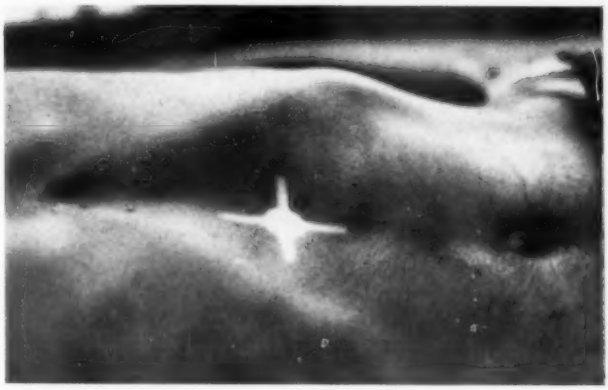


Fig. 3. Central ray indication.

All optical elements are individually adjustable on installation. There are unlimited possibilities of adaption to various types of tubes with different focus positions. The mirror mount includes a ball-joint which is completely stable and permits of any necessary adjustment.

The illumination lamps are of the low-voltage type and of about 10 volts. Power is supplied from a small transformer, which is most conveniently placed close to the ceiling of the room. An easily accessible rheostat of the continuous variability kind makes possible an alteration in the illumination; this is necessary in connection with fluoroscopic work.

Fig. 4 shows a close-up of a tube with the positioning device fitted. By making use of the conical or cylindrical extension piece to be found in practically all tube hoods and which supports the diaphragm frame a maximum of space economy is possible. The device is extremely light, and therefore the manipulation of the roentgen tube is quite easy. It may be directly adapted to any ordinary single-plane diaphragm of the slit or laminar type, and may therefore be fitted to and supplement older units. If so desired, a metal pointer may also be fitted occasionally: it may sometimes be helpful by permitting visual aiming along the path of the rays.

The central ray indication is shown in operation in Fig. 3, as seen at a close distance. The projected image is distinctly visible on the skin of the patient. The picture field indication is illustrated in Fig. 5. The illuminated area is clearly visible even in well-lighted rooms.

In order to facilitate the use of variable diaphragms and make these more convenient, the author has designed an adjustable device consisting of two sliding knobs, each governing a pair of diaphragm shutters. The

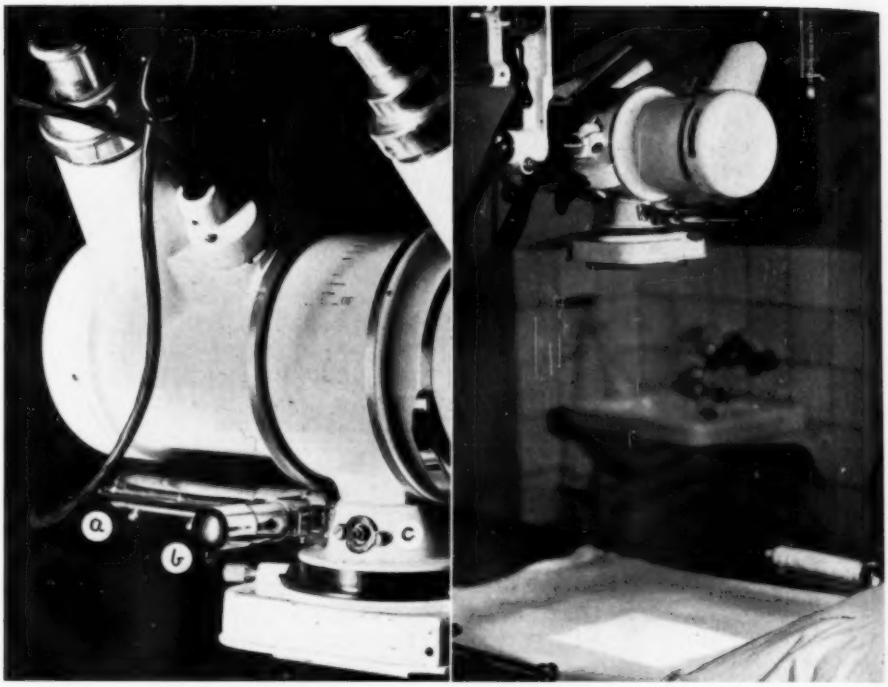


Fig. 4. Fig. 5.

Fig. 4. a. The tubular part contains the projection system for central ray marking. b. The small lamp hood containing the movable lamp for the picture field marking. c. The conical part between the roentgen tube and the diaphragm frame containing the mirror.

Fig. 5. The picture field is indicated by the illuminated area.

knobs can be set along a scale to different figures corresponding to the film sizes to which the limits of the picture field may then be adapted. The arrangement is useful for all ordinary tube-film distances as the scale may be easily changed. Fig. 6 shows a lead shutter of the type ordinarily used in connection with screening, and equipped with the adjusting arrangement. The scale is easily visible in the picture.

As a conclusion, it may be said that the device has been primarily designed for the purpose of indicating the central ray, necessary for every roentgen tube, and to take over the function of the metal pointer. Its field indication is particularly well suited for use with variable diaphragms and permits the selection of the primary aperture most effective for a

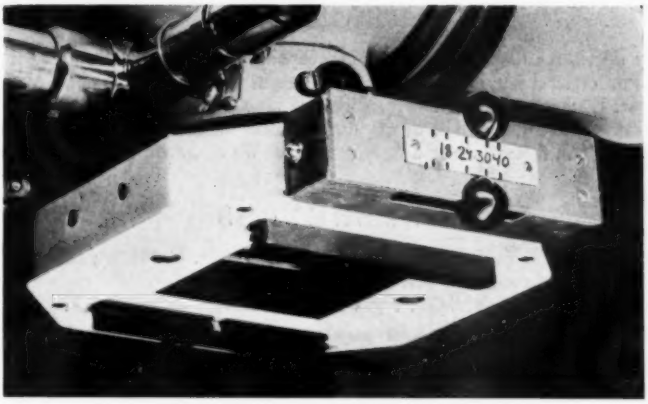


Fig. 6. A suitable diaphragm shutter with a simple and convenient adjusting device.

given case. Its small dimensions make it possible to attach it to practically any type of tube hood. The simplicity of the design reduces the need for maintenance, and after the final adjustment of the apparatus no servicing is required except for the replacement of bulbs. The attachment has been in use for about half a year with extremely good results and operators find it convenient and accurate.

The apparatus will be manufactured by Elema AB, Stockholm.

SUMMARY

The author describes an optical centering device for roentgen tubes which indicates the central ray by means of a projected pattern of light, and also shows the picture field by means of an illuminated area. The apparatus is compact, and may be fitted to most types of tubes. It is best suited for use in combination with a variable primary diaphragm which has been equipped with an adjustment device permitting direct readings of the size of the picture field in question.

ZUSAMMENFASSUNG

Der Verf. beschreibt eine optische Zentrierungsanordnung für Röntgenröhren, welche den Zentralstrahl mit Hilfe eines projizierten Lichtbündels indikiert und die Grösse des Bildfeldes durch eine erleuchtete Fläche angibt. Der Apparat ist kompakt und kann an die meisten Röntgenröhrentypen angeschlossen werden. Am besten ist er für Anwendung in Kombination mit einer variablen Primärblende geeignet, welcher mit einer zusätzlichen Anordnung, die ein direktes Ablesen der Grösse der entsprechenden Feldgrösse erlaubt, ausgerüstet ist.

RÉSUMÉ

L'auteur décrit un dispositif de centrage optique pour les tubes de radiologie, qui indique le rayon central par la projection d'un dessin lumineux et le champ par une surface lumineuse. L'appareil est peu volumineux et peut être adapté à la plupart des types de tubes. C'est en combinaison avec un diaphragme variable équipé d'un dispositif de réglage permettant la lecture directe des dimensions du champ qu'il convient le mieux.

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FROM THE ROENTGEN DEPARTMENT (DIRECTOR: PROFESSOR KNUT LINDBLOM),
KAROLINSKA SJUKHUSET, STOCKHOLM, SWEDEN

A NEW INSTRUMENT FOR HYSTEROSALPINGOGRAPHY

by

Lennart Kjellman

The various instruments used for the introduction of contrast media in hysterosalpingography have certain basic features in common. Their length depends on the anatomic conditions; they are as a rule straight and, above all, inflexible. The extremity of the instrument directed towards the cervix is, at varying distances from its orifice, equipped with a conical attachment of rubber, plastic material or metal which serves to prevent leakage, whether the instrument is held in position against the cervix by hand or by other means.

Manual application does not, however, appear to permit the patient to perform the movements necessary for a comprehensive examination. Furthermore, the intra-uterine portion of the cannula is usually so long that evaluation of the cervix is hindered by inadequate contrast filling and by deformation.

There are two main types of instrument which may be fixed in the cervix. In one the cannula is held in position by means of clamps applied to the portio. This causes the patient discomfort and even pain, as also does the displacement of the uterus resulting from the inflexibility of the instrument. Further, the point of the instrument as a rule reaches too far up into the cervical canal, giving rise to the adverse effects mentioned.

The same applies to the other device, which is screwed into the cervix by means of a threaded cone of plastic material. In addition, the relatively quick decrease in tonus, a natural sign of fatigue in the uterine musculature, results in an undesirable leakage, and the instrument may even work loose; at least, this has been our experience at Karolinska Sjukhuset. We have found it best from all points of view for the in-

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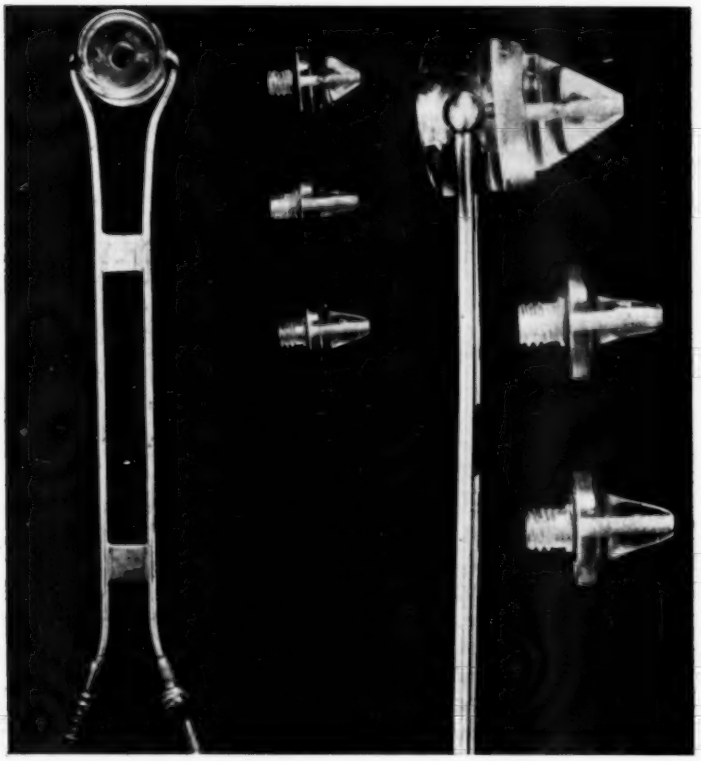

a. b.

Fig. 1. a) The instrument and its various types of cones.
b) A cone partially inserted (lateral view).

strument to be placed in position in the operating room of the Gynaecological Department and the patient moved in her bed to the Roentgen Department.

With a view to eliminating these disadvantages, the instrument described below was devised. Like the instrument for urethrocystography, described in an earlier paper, it is based on the principle of suction attachment of the instrument by means of a bell of acrylic plastic material.

The bell is attached to two parallel tubes of stainless steel which are joined together; the external end of one of these is fitted with a tap and a connection for the contrast material syringe, the other tube having a connection for a vacuum pipe.

The basin-shaped bell is fixed to the internal ends of the tubes and is rotatable around an axis upon rubber washers through its points of attachment. The contrast medium canal emerges at the centre of the basin and at the point of one of the interchangeable cones of plastic material which are screwed into position in this position. These cones are of various calibres and have been modelled on casts of the portio and external uterine orifice obtained from a number of patients with 'Zelex', an impression material used in dentistry.

The evacuation tube, connected to a suction plant, issues at the periphery of the bottom of the plastic basin. By reason of the space between the inner edge of the basin and the base of the olive, the instrument adheres by suction to the portio once the point of the cone has been inserted into the cervix.

Several experiments has shown the instrument to fulfil the demands made upon it. It has adhered so firmly that the patient could make the movements necessary for the examination without discomfort. On no occasion was there any leakage of contrast material — not even in cases of cleft external uterine orifice. Furthermore, deformation of the cervix is obviated by the shortness of the plastic cone which measures only one centimetre, thus enabling a closer study of this region.

Fig. 2. Salpingograms in a case of tuberculous salpingitis showing the instrument in position.
above: Anteroposterior view (supine),
below: Anteroposterior view (patient on her side).

The greatest advantage of this instrument over the types previously in use is that it causes the patient neither discomfort nor pain. This is

due partly to the absence of clamps and partly to the rotation of the suction bell around its axis, thereby eliminating displacement of the uterus.

By means of a three-way tap fitted to the vacuum pipe, a low-pressure chamber — a thick-walled large bottle, for instance — may be connected, permitting transport of the patient with the instrument in position.

The makers are A.B. Stille-Werner, Stockholm 4.

SUMMARY

A new instrument for use in hysterosalpingography, based on the principle of suction, is described.

ZUSAMMENFASSUNG

Ein neues Instrumentarium zur Ausführung der Hysterosalpingographie wird beschrieben. Est ist nach dem Saugprinzip konstruiert.

RÉSUMÉ

Description d'un nouvel instrument d'hystérosalpingographie fonctionnant par aspiration.

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FROM THE RADIUM CENTRE FOR JUTLAND, AARHUS, DENMARK (DIRECTOR: PROFESSOR CARL KREBS)

RADIATION TREATMENT OF HEMANGIOMAS

by

Johannes Thoms and *Niels Fjeldborg*

The discomforts from benign blood-vessel tumors are essentially of a cosmetic nature, although they may, in some cases, involve impairment of function.

Many therapeutic measures have been attempted: surgical excision, application of carbon dioxide snow, injection of sclerosing fluids, electrocoagulation, cosmetic disguise, ultraviolet irradiation, and tattooing. Each of these measures has or has had its advocates. However, the majority of writers hold the view that some form of radiation therapy gives the best cosmetic results, although it must be emphasized that this does not apply to capillary hemangiomas.

Irradiation may be administered either by means of contact radium (1, 3, 7, 22, 37, 38), radium moulds at varying distances (2, 30), radium tubes in glass applicators (27, 34) or interstitial radium needles (4, 5, 6, 9, 23, 32). Other writers use roentgen irradiation (10, 12, 13, 15, 24, 29) or a combined radium and roentgen therapy (14, 25).

Hemangiomas may disappear spontaneously, for which reason TRAUB recommended that stationary hemangiomas should be left untreated during the first year of life. According to LISTER's experience, it is essentially the rapidly growing hemangiomas which after progression during the first year of life gradually regress and ultimately disappear spontaneously at about the age of five years. However, spontaneous disappearance occurs only in a minority of cases (GRAWFORD), and if the healing process passes through an ulcerative stage with ensuing scar formation, a satisfactory cosmetic result is not obtained (SCHREUS). Moreover, in view of the fact that the radiosensitivity of hemangiomas decreases markedly after the first two years of life, it is now generally agreed that treatment should be instituted as early as possible — preferably within the first three months of life.

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The danger of radiation damage to adjacent tissues and organs has been strongly emphasized. ANDREW reported one case and WATSON and MCCARTHY seven cases of radiation damage to the eye lens; in view of this experience ANDREW et al. considered it safer to treat hemangiomas situated on the eyelids by injections of a sclerosing solution, although this procedure may give a less satisfactory cosmetic result. PENDERGRASS et al. reported a case of permanent epilation of the eyelashes (but without ocular changes). Cases of osseous changes in the form of radionecrosis or retardation of development were described by NEWCOMET, ANDREW, PROUTY, v. OEYNHAUSEN, and POPPE, and a case of severe damage to the developing dental tissue was observed by RUSHTON. Finally, LABORDE reported a case of injury to the central nervous system following radium therapy and UNDERWOOD and GAUL a case of mammary aplasia. In addition, damage to the skin at the site of treatment may give rise to an unsatisfactory result (JENS NIELSEN, HULTBERG, GRAU, and LARSEN).

Case Material

To obtain a reasonably long period of observation, cases which were treated for the first time in 1941 at the Radium Centre in Aarhus were selected for this study.

The treatment of stellar hemangioma (spider marks) does not involve any special problems, for which reason this lesion has been excluded from the material. Suffice it to say that there were 63 cases of this type, and that the treatment mostly consisted in thermopuncture of the central vessel with a red-hot platinum needle or desiccation needle; in a few cases freezing with carbon dioxide snow for 1—2 minutes was used. In all cases the cosmetic result was excellent.

The total case material consists of 247 patients with 293 hemangiomas, certain patients having several angiomas (2—5) in different situations.

The sex distribution was 77 males (31 per cent) and 170 females (69 per cent). Of all the patients, 73 were within the age group 6—12 months; 32 per cent being under 6 months and 61 per cent under 12 months of age. The number of cases of the various forms of hemangiomas were: capillary (nevus flammeus) 36, superficial cavernous 158, deep cavernous 6, and mixed type 47. Of the lesions, 136 were small (under 1.5 cm in diameter), 78 of medium size (1.5 to 2.5), 72 were large (over 2.5 cm), and 7 were very large (larger than a palm of a hand). Large hemangiomas had the highest relative frequency in the group of cavernous hemangiomas of the mixed type. As to the situation, it may be mentioned that 162 (55 per cent) were found on the head, 90 of these (31 per cent) on the face, and 46 (16 per cent) on the extremities. Ulceration of the

hemangioma occurred in 19 cases; it was present at the institution of treatment in ten and developed during treatment in nine instances.

Method of Treatment

The method of treatment varied according to the type of the angioma, its size and the effect obtained; it was often changed during the course of treatment of the individual angioma.

For contact radium treatment, flat applicators with 2.5 mg radium (1 × 1 cm) or 5 mg radium (2 × 2 cm), with a filter of 0.1 mm monel metal, were used. The exposure time varied with the age of the patients, being 15 minutes at 3 months, 30 minutes at 6 months and 60 minutes for patients of at least 12 months of age.

The majority of the patients who received roentgen treatment were given short-distance radiation with a "Monopan" contact therapy unit. The factors of irradiation were 60 kv., 4 ma., focal skin distance 3—5 cm, filter equivalent to 0.15 mm Cu. In some cases softer qualities of radiation, with 26 kv. or Bucky rays 12 kv., were used. Finally, some cases of capillary hemangioma were treated with radium emanation in wax sheets.

Only one patient was admitted to hospital during treatment; all the others were treated as out-patients.

A period of 4 months was allowed to elapse after the first treatment, and subsequent treatments were given at intervals of 4—6 months. A slow, gradual regression of the angiomas with a minimum of radiation exposure was aimed at.

The question as to further treatment was normally decided by the medical staff of the Out-patient Department of the Radium Centre and only in exceptional cases by the family physician.

Capillary hemangioma. Of a total of 37 cases of this type, 26 were treated with Bucky rays or radium emanation in wax sheets combined with Bucky rays. In three cases no treatment was given, because spontaneous disappearance was expected, due to the situation of the hemangioma over the glabella or at the occipital margin of the scalp. The remaining eight cases received other types of combined radiation therapy. The number of exposures were more than 6 in 18 cases, 4—6 in eight and 1—3 in the remaining eight cases.

Superficial cavernous hemangioma. Of a total of 199 cases of this type, 183 were given contact radium treatment, either alone (150 cases) or in combination with Monopan short-distance radiation (33 cases). The number of exposures were more than 6 in 23 cases, 4—6 in 97 and 1—3 in 63 cases. Eleven hemangiomas were given other types of radiation therapy, and the remaining five were treated with electrocoagulation, surgical excision or carbon dioxide snow.

Deep cavernous and mixed-type hemangiomas. These types were mostly given Monopan short-distance radiation, either alone (13 cases) or in combination with contact radium radiation (29 cases). Contact radium therapy alone was used in nine instances; for various reasons, excision was performed on five patients either at once or during the period of radiation treatment. One patient failed to return for further treatment. Of a total of 51 cases of hemangioma treated with irradiation in this group, only ten received more than 6 exposures, twenty-five 4—6 exposures and sixteen 1—3 exposures.

Results

When complete disappearance of the hemangioma was obtained, and the skin assumed a normal appearance and consistency, the result was classified as excellent. When a satisfactory cosmetic result with a smooth surface and a normal, soft consistency of the skin was apparent, this was described as good, although, due to small depigmentations and, possibly, very slight atrophy, the site of treatment could be recognized by a closer inspection.

Capillary hemangioma. A good result was obtained only in seven cases; the condition remained unchanged in seventeen; marginal areas of the hemangioma persisted in nine and unsightly scarring and pigmentation developed in one instance.

Superficial cavernous hemangioma. Of the patients with only one small hemangioma, nine failed to return for further therapy after the first treatment and must therefore be disregarded in the evaluation of the results. In three patients over 20 years of age, the lesion was not congenital. In one of these cases the result was good, while the other two failed to complete the course of treatment. The results obtained in the remaining 182 cases appear from Table 1.

Table 1

Results of treatment in 182 cases of superficial cavernous hemangioma

Cases	Age	Results of treatment				
		Excellent	Good	Unchanged	Residual hem-angioma	After-effects
21	Under 3 months	6	13		1	1
50	3—6 months	9	32	2	5	2
69	6—12 »	16	40	2	4	7
27	1—2 years	7	15		3	2
10	2—20 »		6	2	2	
5	Over 20 years		2	2	1	
182		146 = 80 %		8	16	12

Deep cavernous and mixed-type hemangiomas. Three patients failed to return for further therapy after the first treatment. In five patients over 19 years of age the hemangiomas were not congenital. All these five patients had a small hemangioma of the lip; in one of these cases the result was good, while the remaining four patients did not complete the course of treatment. The results obtained by radiation therapy in the remaining 43 cases of this group are shown in Table 2.

Table 2

Results of treatment in 43 cases of deep cavernous and mixed-type hemangiomas

Cases	Age	Results of treatment				
		Excellent	Good	Unchanged	Residual hemangioma	After-effects
5	Under 3 months.....	3	1			1
11	3—6 months.....	1	8		1	1
13	6—12 »	4	6	1	2	
9	1—2 years.....	1	7		1	
4	2—20 »	1	2		1	
1	Over 20 years.....		1			
43		35 = approx. 80 %		1	5	2 (+ 1[1])

[1] Included among good results despite radiation injury, see case 5.

Thus, within the groups of cavernous hemangiomas, both superficial, deep and mixed type, nine cases remained unchanged. Six of these patients interrupted the course of treatment before the effect could be assessed. One case of radioresistant fibro-angioma had to be referred for surgical treatment. Combined radium and short-distance roentgen radiation proved ineffective in one patient, who was 4 years old when first seen, and also the last case was radioresistant in spite of early institution of radiation therapy.

In 21 cases a remainder of the hemangioma persisted, but 15 of these patients responded normally to treatment, with gradual flattening and paling of the lesion. After 1—6 exposures the patients failed to return for further therapy, and it may be permissible to presume that the residual area of the hemangioma had disappeared. The remaining six hemangiomas showed slower and less pronounced regression in spite of 7—14 exposures. One of the patients was 34 years and two 18 months old, when first seen.

Fourteen hemangiomas disappeared, although after-effects in the form of scarring, telangiectases or partial scarring (plus residual hemangioma; 2 cases) developed. Five of these were complicated by ulceration and four were treated with a greater intensity than normal (8—10

exposures distributed over 2—8 years). Only five uncomplicated cases, which had been given a maximum of 5 exposures with the usual dosage, presented after-effects after the disappearance of the hemangioma.

It must be emphasized that of the above-mentioned 44 cases of hemangioma, fourteen were large and two very large.

Thus, of the 225 cases of cavernous hemangioma, eleven (4.9 per cent) were resistant to the radiation therapy used and after-effects were present in fourteen (6.2 per cent) at the termination of treatment.

Follow-up Examinations

To evaluate the long-term results of the treatment, 60 patients with 73 hemangiomas were followed up. At least 10 years had elapsed from the first treatment to the time of the follow-up examination. These patients lived in the neighbourhood of the Radium Centre, *i. e.* in the city or county of Aarhus. No other form for selection was made, and the composition of these cases corresponded closely to that of the entire series. Of these patients, 15 were males and 45 females, and 44 had been less than 12 months old at the first treatment.

Table 3 shows a comparison between the results at the termination of treatment and those observed at the follow-up examination. To facilitate comparison, excellent and good results have been placed in one group and those compromised in some way, in another.

As appears from the table, the result had changed in the meantime in some cases, and examples both of deterioration and improvement are given below.

Table 3

A comparison between the results of treatment in 73 cases of hemangioma assessed at the termination of treatment (result I) and at the follow-up examination at least 10 years after the first treatment (result II). Added: a specification of the different sequelae

Type of hemangioma	Cases	Result I	Result II					
			Good	Compr.	Residual hem-angioma	Scarring	Teleangi-ectases	Other sequelae
Capillary	6	Good 1	1					
		Compr. 5	2[1]	3	3			
Superficial cavernous .	53	Good 41	37	4		1	3	
		Compr. 12	6	6	1	5	2	
Deep cavernous	1	Good 1	1					
		Compr.						
Mixed type	13	Good 10	5	5		4	3	1
		Compr. 1	1	2	1	1		
Total		73	53	20				

[1] One case situated at the occipital margin of the scalp, the other over the glabella.

Report of Cases

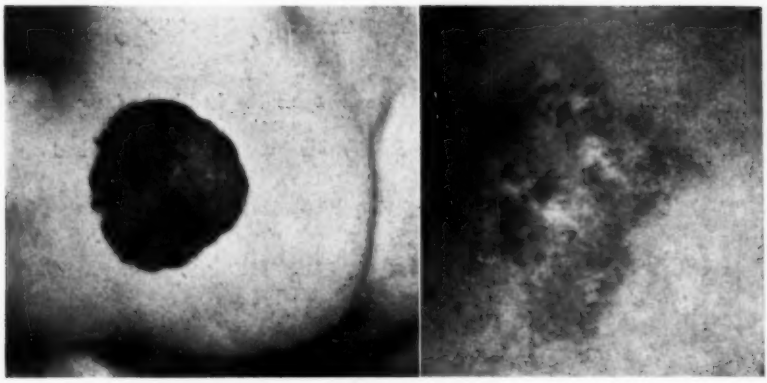
Deterioration of result:

Case 1. A boy (out-patient 1340/41), aged 3 months, had had a large, progressive superficial cavernous hemangioma on the medial aspect of the left thigh since birth (fig. 1 a). Ten days before the first examination ulceration and bleeding had occurred.

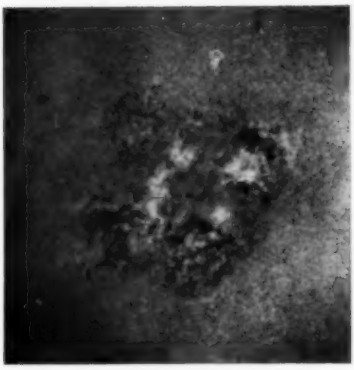
a. b.

c.

Case 1. Fig. 1. (a) A three-month-old boy with superficial cavernous hemangioma. (b) Same patient, four years later. Marginal area still persisted. (c) Ten years later. Scar tissue and marginal telangiectases. No serious radiation injury.



a. b.



c.

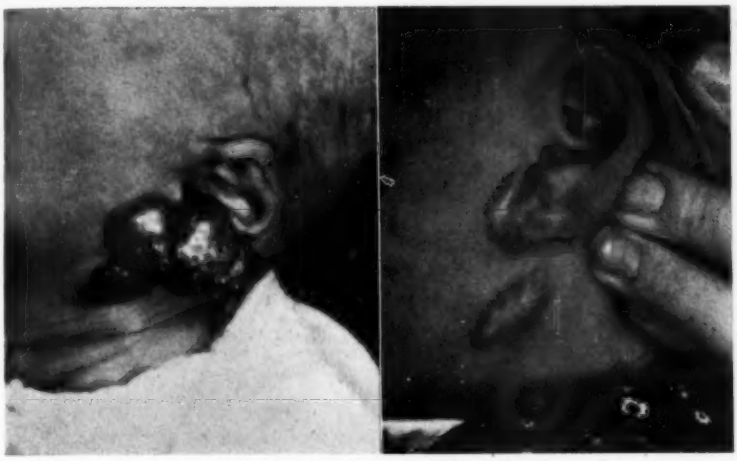
Case 2. Fig. 2. (a) A nine-month-old boy with superficial cavernous hemangioma. (b) Same patient, three years later. The hemangioma has almost disappeared. (c) Ten years later. Skin atrophy, scarring and telangiectases.

Seven treatments with contact radium were given at intervals of 4—6 months. At the age of 4 years the last treatment was given, and one year later the hemangioma had completely disappeared. At the last treatment a marginal area of the lesion still persisted (fig. 1 b).

At the follow-up examination slight contraction of scar tissue and marginal telangiectases were observed (fig. 1 c). There were no signs of any serious radiation injury.

Case 2. A boy (out-patient 882/41), aged 9 months, had had a progressive superficial cavernous hemangioma on the left buttock since birth (fig. 2 a). Four short-distance roentgen treatments at intervals of 2—8 months making a total dose of 1,600 r, combined with four contact radium treatments, were given. The period of treatment extended over 2 years. One year after the last treatment the hemangioma had almost completely disappeared (fig. 2 b), but subsequently evidence of excessive irradiation developed.

At the follow-up examination skin atrophy of a patchy distribution, scarring and prominent telangiectases were noticed (fig. 2 c).



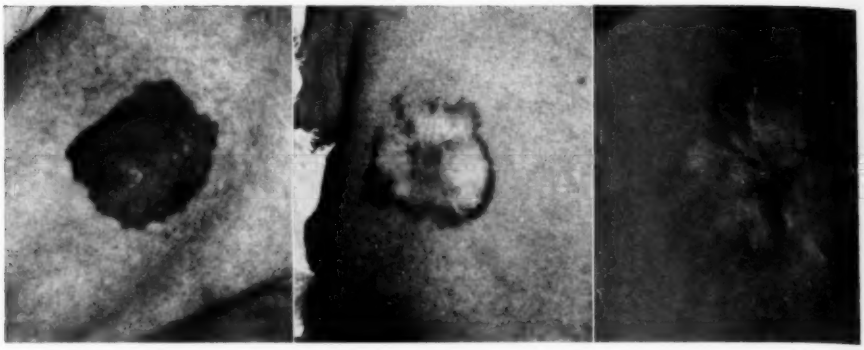
a. b.

c.

Case 3. Fig. 3. (a) A three-month-old girl with superficial cavernous hemangioma and superficial ulceration. (b) Same patient, six months later. Two scars, surrounded by a red marginal residual hemangioma. (c) Ten years later. Residual hemangioma has disappeared.

Improvement of result:

Case 3. A girl (out-patient 1305/41), aged 3 months, had had a rapidly growing, large superficial cavernous hemangioma, with superficial ulceration, on and below the left ear since birth (fig. 3 a). Three short-distance roentgen treatments, making a total dose of 1,500 r to each of two fields, were given in the course of 6 months, supplemented with one contact radium treatment. Gradual regression occurred, but when last seen,



a. b. c.

Case 4. Fig. 4. (a) A two-month-old boy with cavernous hemangioma of mixed type. (b) Same patient, fifteen months later. Marginal area of the hemangioma persists at the termination of the treatment. (c) Ten years later. Smooth scar. The hemangioma has completely disappeared.

scarring had developed in two places, surrounded by a red marginal residual hemangioma (fig. 3 b).

At the follow-up examination two pale scars with slight telangiectases were present, but the residual hemangioma at the margin had disappeared (fig. 3 c).

Case 4. A boy (out-patient 1197/41), aged 2 months, had had a large cavernous hemangioma of mixed type on the left trochanteric region since birth (fig. 4 a). Short-distance roentgen treatment, 400 r, and three contact radium treatments were given at intervals of up to 5 months. Ulceration, 1 cm deep, developed and subsequent healing resulted in scar formation. At the termination of the treatment a marginal area of the hemangioma persisted (fig. 4 b).

At the follow-up examination a smooth scar was present, but the marginal remainder of the hemangioma had completely disappeared, and there were no telangiectases (fig. 4 c).

The following case is an example of a completely satisfactory cosmetic result in spite of the presence of radiation injury.

Case 5. A boy (out-patient 1239/41), aged 3 months, since birth had had a very large disfiguring cavernous hemangioma of mixed type, possibly with a mixture of lymphangioma, extending from the upper lip across the nose up to and involving the right upper eyelid (fig. 5 a). A total of 11 treatments with either radium or short-distance roentgen radiation were given. Seven contact radium treatments were administered at intervals of 2—6 months. In addition, the patient received 300 r to the right eyelid, 1,500 r to the nose (4 exposures) and 2,100 r to the upper lip (7 exposures). Gradual regression occurred till the patient was given the last treatment at the age of 4 years.

At the follow-up examination the upper lip and the nose had a completely normal appearance. There were only a few, slight telangiectases on the right eyelid. It was stated that the eyelashes had fallen out completely after the termination of the treatment, but regrowth had occurred during the last two years prior to the follow-up examination,

a. b. c.

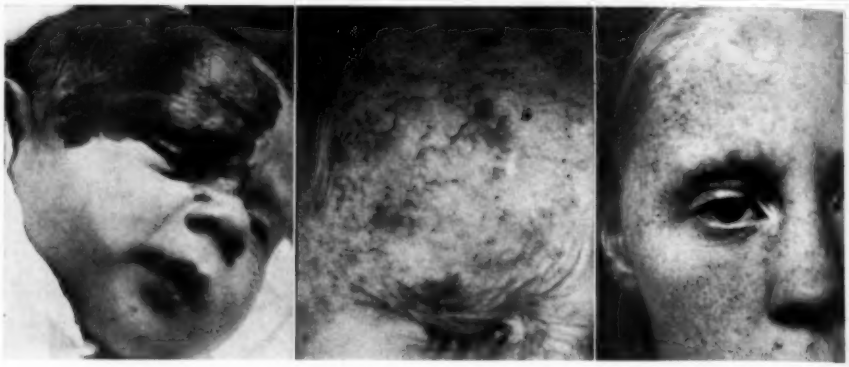
Case 5. Fig. 5. (a) A three-month-old boy with cavernous hemangioma of mixed type from the upper lip across the nose involving the right upper eyelid. (b and c) Same patient, ten years later. Normal appearance of the upper lip and the nose. Few telangiectases on the right eyelid, eyelashes missing on the lateral 5 mm.

although the lashes were still missing on the lateral 5 mm of the edge of the eyelid, in which area slight scarring was noticed (fig. 5 b and c). Vision was normal.

The last case report shows that a hemangioma may be a very serious affection.

Case 6. A girl (1263/41), aged 6 weeks, had had a large cavernous hemangioma of mixed type in the submental region and a similar lesion, 8 × 8 cm, on the right side of the neck since birth; the latter extended upwards both in front of and behind the ear. The hemangioma on the neck was rapidly growing, and the growth continued in spite of two short-distance roentgen treatments and one contact radium treatment given over a period of 7 months. At the second check-up examination, ulceration of the hemangioma had developed. At the age of 9 months the patient was admitted to hospital. Shortly after admission, profuse bleeding occurred from the ulcerated hemangioma, and at the same time right-sided peripheral facial paralysis developed. The patient had to be given a blood transfusion. During the next year the patient received four treatments with radium moulds (10 mg tubes) at a distance of 0.5 cm and one treatment with radium in glass applicators according to the method of STRANDQUIST. During the course of treatment and the next three years the hemangioma gradually decreased in size. After three supplementary contact radium treatments and two short-distance roentgen treatments (1,000 r) the hemangioma almost disappeared, but distinct scarring occurred. Long-continued electrotherapy (Myotensor) resulted in some improvement of the facial paralysis. A roentgen examination carried out when the patient was 8 years old did not reveal any evidence of radionecrosis of bone.

At the follow-up examination a large area with contracted scar tissue was present, but it did not restrict the mobility of the neck. Slight facial paralysis persisted, the mouth becoming somewhat asymmetrical when the patient attempted to whistle or smile.



a. b. c.

Fig. 6. (a) A two-month-old girl with an extensive superficial cavernous hemangioma. (b) Same patient, seven years later. Marked telangiectases developed during the course of treatment. (c) Same patient at the age of 16 years. The result is now good.

Comments

The sex distribution of the patients and the situation of the hemangiomas are in good agreement with those of other comprehensive studies.

In our experience, treatment should be instituted at the earliest possible time. The treatment may be concluded, even though a marginal area of the hemangioma persists; presumably, this residual hemangioma will in most cases disappear afterwards, whereas continued treatment involves increased risk of the formation of scars and telangiectases. Otherwise, the therapeutic result is dependent on the size of the lesion and the presence or absence of ulceration. Only a minority of cases are radioresistant.

It may be mentioned that the disfiguring telangiectases may sometimes regress in the course of some years; figure 6 is an illustrative example of this. The patient in question was treated in the hospital some years before those of the present series; the girl received long-continued, vigorous contact radium therapy, following which, telangiectases developed (fig. 6 b). However, 16 years after the first treatment these had almost completely disappeared (fig. 6 c).

With the technique of treatment and dosage used, the risk of radiation injury is minimal. The facial paralysis in case 6 was presumably due to formation of a hematoma around the facial nerve following profuse bleeding.

As emphasized by MacKee and Cipollaro, a capillary hemangioma does not respond satisfactorily to radiation therapy unless a dosage which destroys the upper layer of the skin is used. Light treatment with the Kromeyer lamp (MacCollum) or the Intensol lamp (Lomholt) seems to give at least equally good results. The use of radioactive phosphorus (Low-Beer) or tattooing (Conway) may prove to be fresh advances in the treatment of capillary hemangiomas.

SUMMARY

A brief survey of the various methods of treatment of hemangiomas is given, and two important problems are emphasized, viz. the question as to spontaneous regression and the risk of radiation injury.

A series of 247 patients with 293 hemangiomas treated mainly with contact radium or short-distance roentgen radiation (60 kv.) are analyzed. The results of treatment of capillary hemangiomas were poor. On the other hand, in 225 cases of cavernous hemangiomas, a fully satisfactory result was obtained in 80 per cent of the cases; 4.9 per cent were radioresistant and 6.2 per cent presented after-effects at the termination of the treatment.

A follow-up examination on 60 patients with a total of 73 hemangiomas was carried out at least 10 years after the first treatment. It is emphasized that the results may change in the course of the years, and examples of both deterioration and improvement are given in a few illustrative case reports.

ZUSAMMENFASSUNG

Die verschiedenen Behandlungsmethoden für Hämangiome werden kurz zusammengefasst und 2 wichtige Probleme hervorgehoben, nämlich die Frage de. spontanen Rückbildung und die Gefahr der Strahlenschädigung.

Eine Serie von 247 Patienten mit 293 Hämangiomen, die hauptsächlich mit Kontaktradium oder Röntgennahbestrahlung (60 kV) behandelt worden sind, werden analysiert. Die Behandlungsresultate der kapillären Hämangiome waren schlecht. Andererseits wurde bei 225 Fällen mit kavernösen Hämangiomen in 80 % der Fälle ein völlig zufriedenstellendes Resultat erreicht. 4.9 % der Fälle waren strahlenresistent und 6.2 % zeigten Spätwirkungen bei Beendigung der Behandlung.

Eine Nachuntersuchung von 60 Patienten mit zusammen 73 Hämangiomen wurde mindestens 10 Jahre nach der ersten Bestrahlung vorgenommen. Es wird hervorgehoben, dass die Resultate sich im Laufe der Jahre ändern können. Beispiele für sowohl Verschlechterungen als auch Verbesserungen werden in einigen wenigen illustrativen Fällen berichtet.

RÉSUMÉ

Les auteurs exposent brièvement les différentes méthodes de traitement des hémangiomes et insistent sur deux problèmes importants, à savoir la question de la régression spontanée et le danger de radio-lésions.

Ils analysent une série de 247 malades présentant 293 hémangiomes traités surtout par curiethérapie de contact et roentgen thérapie à courte distance (60 kv.).

Les résultats thérapeutiques ont été mauvais dans les hémangiomes capillaires. Au contraire, sur 225 cas d'hémangiomes caverneux, le résultat a été tout à fait satisfaisant

dans 80 pour cent des cas; 4.3 pour cent se sont montrés radio-résistants et 6.2 pour cent ont présenté des radio-lésions à la fin du traitement.

Un examen de contrôle de 60 malades présentant au total 73 hémangiomes a été fait 10 ans au moins après le premier traitement. Les auteurs soulignent que les résultats peuvent se modifier avec le temps, et ils donnent comme exemples quelques observations, aussi bien d'aggravation que d'amélioration.

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AUS DER ALLGEMEINEN ABTEILUNG DES RADIUMHEMMET IN STOCKHOLM (STELLVERTR. CHEFARZT: DOC. DR. SVEN HULTBERG) UND DEM RADIOPATHOLOGISCHEN INSTITUT (STELLVERTR. CHEF: MED. DR. LARS SANTESSON)

EIN FALL VON SOG. »MELANOCARCINOMA CONGENITUM PROCESSUS ALVEOLARIS« (KROMPECHER)

von

G. Notter und *G. Söderberg*

Die melaninhaltigen Tumoren im Processus alveolaris des Unter- und Oberkiefers, die bereits während des 1. Lebensjahres auftreten, sind äusserst selten und nehmen, wie schon KROMPECHER hervorhebt, eine Sonderstellung ein. Verlauf und Prognose sind wie bei den präpubertalen, histologisch malignen Melanomen klinisch meistens gutartig im Gegensatz zu den bei Beginn oder nach der Geschlechtsreife auftretenden, die durch ihr schnelles Wachstum und explosionsartige Metastasierung eine kausale Therapie nahezu aussichtslos erscheinen lassen.

SPITZ (8) beschrieb 1948 unter 13 präpubertalen Melanomen nur einen klinisch bösartigen Fall, der ein 12 jähriges Mädchen betraf, das bisher noch keine Menarche oder Zeichen sekundärer Geschlechtsmerkmale zeigte, bei dessen Alter man aber nicht mehr mit Sicherheit einen Einfluss der beginnenden Hormonumstellung ausschliessen konnte. Ein Melanom der Fussohle führte hier innerhalb von 4 Monaten durch allgemeine Metastasen zum Tode. Die übrigen Fälle wurden alle mit einfacher lokaler Exzision geheilt und nur in 1 Falle musste später eine Gruppe metastasenverdächtiger Lymphknoten in der Leiste entfernt werden.

Auch COFFEY und BERKELEY (1) wiesen 1951 auf das klinisch meistens gutartige Verhalten der präpubertalen Melanome hin, obgleich deren histologisches Bild bösartig ist. Sie führen 3 Fälle aus dem Schrifttum an, bei denen es zwar zur Metastasierung in die regionären Lymphknoten gekommen war, man aber durch Ausräumen der entsprechenden

Bei der Red. am 14. III. 1953 eingegangen.

Gebiete die Patienten heilen konnte. Selbst beschreiben sie ein 7 Jahre altes Mädchen mit einem histologisch verifizierten Melanom am Sacrum und einer solitären Metastase in der linken Leiste. Die femoralen, inguinalen und iliacalen Lymphknoten der linken Seite sowie die femoralen und inguinalen Lymphknoten der rechten Seite wurden ausgeräumt, histologisch waren sie aber frei von weiteren Metastasen.

Ein sog. »wahres« congenitales Melanom wurde bisher nur von COE (angeführt bei COFFEY (1)) beschrieben. Hierbei muss eine transplacentare Metastasierung ausgeschlossen werden können. Die Entstehung des Melanoms wird auf die Einwirkung der mütterlichen Hormone zurückgeführt.

Transplacentare Melanome wurden mehrere beschrieben, wobei spätestens nach 1 Jahr der Tod des Kindes und der der Mutter noch früher eintritt. Die einflussreiche Rolle der Hormone bei der Melanombildung ist heute unbestritten. Die vermehrte Pigmentansammlung in verschiedenen Hautbezirken und die deutliche Verschlechterung von Melanomen während der Schwangerschaft zeigt dies klar. Bei Fischen und Fröschen tritt dieser Einfluss in der Paarungszeit noch deutlicher zutage und wurde auch experimentell nachgewiesen.

Der Gedanke liegt daher nahe, durch eine Umstellung des Hormonhaushaltes (Hypophysenbestrahlung, Hypophysektomie, Kastration, Adrenektomie, Zufuhr verschiedener Hormone) die Entwicklung der Melanome zu beeinflussen. Bisher sind aber ausser sporadischen Erfolgen noch keine Heilungen erzielt worden.

Den 1. Fall von »Melanocarcinoma congenitum processus alveolaris« beschrieb KROMPECHER (6) 1918 als Anhang einer Studie zur Histogenese und Morphologie der Adamantinome und sonstiger Kiefergeschwülste und trennte diese Geschwulst klar von den Melanomen der Erwachsenenkiefer ab, die histogenetisch nach EISENMENGER aus Pigmentflecken der Mundschleimhaut im harten und weichen Gaumen hervorgehen und deren PERTHES 1907 19 Fälle beschrieb. KROMPECHER leitete den Tumor von den »débris épithéliaux paradentaires« der Schmelzanlage ab und beschrieb diesen Tumor eingehend.

»Es handelt sich um einen 2 monatlichen Säugling, an dessen rechten Processus alveolaris sich halbkugelförmig eine haselnussgrosse, solide, ziemlich derbe Geschwulst vorwölbt. Die Oberfläche erscheint glatt, von Schleimhaut überzogen, scharf abgekapselt. Die Schnittfläche lässt eine fein-alveoläre Struktur von stellenweise bräunlicher Farbe erkennen. Dicht unterhalb der Schleimhaut findet sich ein etwa 7 mm langer und 3 mm dicker Zahn.

Mikroskopisch handelt es sich um ein typisches alveoläres Melanocarcinom. Das die Oberfläche bekleidende Plattenepithel ist stellenweise verdünnt und abgeplattet. Das subepitheliale Bindegewebe erscheint fibrös, zellarm und schliesst stellenweise weite Lymphspalten ein. Ausser dem ausgebildeten, aus Dentin und Zement bestehenden Zahn findet sich an der Stelle, wo sich das Schleimhautepithel auf die Geschwulst hinüber-

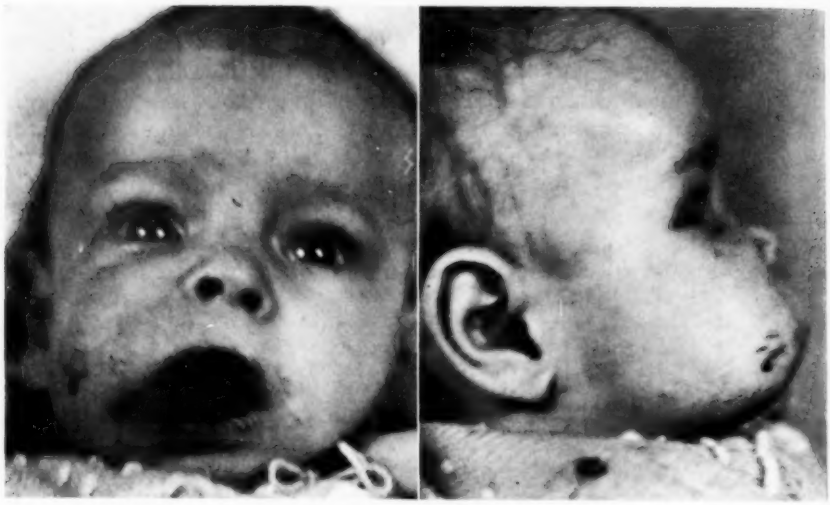

Fig. 1. Das 4 Monate alte Kind bei der Aufnahme. Man sieht deutlich den das Gesicht deformierenden Tumor im rechten Proc. alveolaris maxillae.

Fig. 2. Dasselbe Kind 4½ Monate nach der Operation, jetzt 13½ Monate alt.

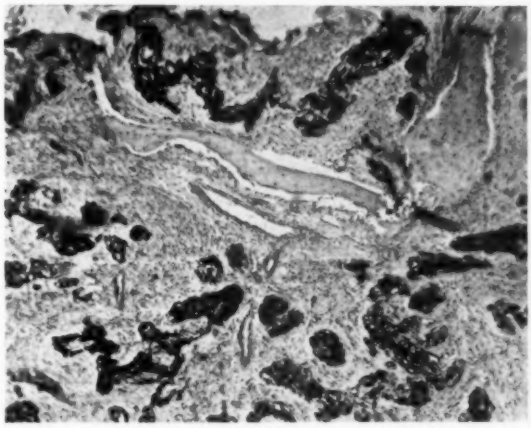

Fig. 3. 60-fache Vergrösserung. Hämatoxylin-Eosin. Alveoläre und strangförmige pigmentierte Tumorzellverbände in gefässreichem, fibrösem Bindegewebe. In der oberen Hälfte Destruktion einer Knochenleiste.

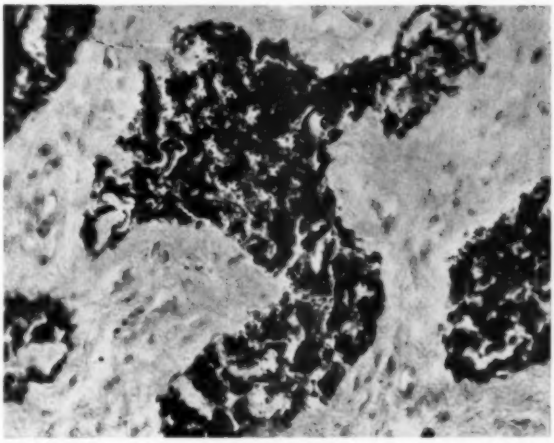

Fig. 4. 290-fache Vergrösserung. Tumorzellen mit feinkörnigem und gröberem, teilweise verklumptem Pigment, das sich mit Massons Silberimprägnierungsmethode wie Melanin schwärzt.

zieht, noch ein die Anfangsstadien der Entwicklung zeigender Zahn. Verbindungen zwischen dem Schmelzorgan und dem Epithel des Kieferrandes in Form des Schmelzorganhalses sind nicht mehr nachweisbar. Hingegen sendet das Epithel der äusseren Schmelzmembran einen langen, dünnen Strang gegen die Kuppe der Geschwulst hin, welcher, von niedrigem Zylinderepithel begrenzt, eine dünne Schicht indifferenter Zellen einschliesst und hier und da kolbenartige Auswüchse treibt. Am stärksten ist das Ende dieses Stranges aufgetrieben, sodass auch der Strang selbst einem Kolben entspricht. Besonders betont sei, dass die kolbenartigen Auswüchse vielfach in Abschnürung begriffen sind, das verdickte Ende des Stranges von einer Menge bereits abgetrennter Schmelzepithelienhaufen umgeben ist, und *dass die indifferenten Epithelien dieser débris epithéliaux paradentaires direkt und ohne scharfe Grenze mit dem Geschwulstgewebe zu-*

sammenhängen resp. in dasselbe übergehen. Letzteres besteht aus plasmaarmen indifferenten Zellen mit rundlichen und länglichen chromatinreichen Kernen und zeigt sehr ausgesprochenen alveolären Charakter. Neben ganz kleinen, nur aus wenigen Zellen gebildeten Alveolen, finden sich grössere und scharf umgrenzte, und zwar in solchem Umfang, dass das zwischen ihnen vorhandene fibröse Bindegewebe an Menge ganz zurücktritt. Beziehungen zwischen dem ausgebildeten Zahn und dem Geschwulstgewebe bestehen bloss insofern, als letzteres im unteren Teil der Pulpa in die erweiterten Lymphspalten des Pulpabindegewebes eindringt und, auch das Zement infiltrierend, dessen oberflächliche Zerstörung bewirkt. Ein ähnliches Verhalten lassen auch die am Grunde des Tumors vorhandenen Knochenbälkchen des Unterkiefers erkennen. Durchaus absonderlich verhält sich das Pigment. Während einzelne Geschwulstpartien ganz frei von solchem sind, schliessen die Zellen zahlreicher Alveolen grosse Mengen desselben ein. Doch auch innerhalb der Alveolen ist die Verteilung des Pigmentes wieder auf gewisse Stellen beschränkt. Während es, der allgemeinen Regel entsprechend, innerhalb der Alveolen meist gleichmässig verteilt, finden sich Stellen, wo dasselbe ausschliesslich die peripheren Lagen der Geschwulstzellen infiltriert, und ist hier in solchen Mengen vorhanden, dass die Geschwulstalveolen von dickeren und dünneren dunkelbraunen Pigmentsäumen eingefasst erscheinen.«

Als 2. Fall beschrieben DUDITZ und SZABO (3) einen 6 Wochen alten Säugling bei dem am 7. Tage nach der Geburt eine erbsengrosse Geschwulst am linken Oberkiefer auftrat, die schnell zunahm. Nach 5 Wochen ragte aus der haselnussgrossen Geschwulst bereits ein Zahn heraus. Die Schleimheut war auch hier überall intakt. Der Tumor war knorpelhart und verdrängte die Nase nach rechts. Man trug den nach aussen ragenden Teil des Tumors ab und röntgenbehandelte ihn, da man ihn für inoperabel hielt, mit 550 r innerhalb von 10 Tagen (3 mm Al, 150 kV, 4 mA, 30 cm FHD). Bereits nach der 3. Bestrahlung begann die Geschwulst zu schrumpfen. Nach einer Pause von 6 Wochen verabreichte man die gleiche Dosis noch einmal. 7 $^1/_2$ Monate nach der Operation war das Kind rezidivfrei und entwickelte sich normal.

Mikroskopisch lagen 3 verschiedene Gruppen von Geschwulstgewebe vor: 1) Alveoläre Partien polygonaler Zellen mit runden oder ovalen Kernen, vielen Mitosen und feinkörniger Pigmentierung. 2) Tumorteile mit grober Pigmentierung in Geschwulstzellnestern und angrenzendem Bindegewebe, daneben pigmentfreie Bezirke. Mit grösster Wahrscheinlichkeit handelte es sich um Melanin. 3) Im Zentrum des Tumors überwiegend bindegewebige Anteile, ähnlich einem zellreichen Fibrom, mit teilweise intrazellulärem feinkörnigem Pigment.

Der Tumor wucherte in den Knochen hinein und liess an manchen Stellen nur mehr feine Knochenlamellen stehen. Die Verff. nahmen an, dass ein Zusammenhang mit der Zahnanlage bestehe. Die äussere Epithelschicht des Schmelzorganes endete gegen das Bindegewebe zu in Kolben, die zum Teil in die Länge gezogen waren. Auch Malassez'sche Epithelinseln waren zwischen den Tumorzellen sichtbar. Die Verff. setzten ihren Fall histogenetisch und histologisch gleich dem KROMPECHERS. Sie warfen die Frage nach der Herkunft des Pigmentes auf. Ist es ein Produkt der Tumorzelle oder der normalen Epithelzelle?

SÖDERBERG und PADGETT (9) beschrieben 1941 2 Fälle von »unusual melanomas of the alveolus und maxilla« bei einem 1 Monat und 3 Monate

alten Mädchen. Im ersten Falle handelte es sich um einen klinisch benign wachsenden, kapselversehenen, melaninhaltigen Tumor, der einem angiomatösen und myxomatösen Teratom glich. Das Mädchen erhielt postoperativ 6—7 HED mit einer äusseren Radiumapplikation und war nach 6 Jahren rezidivfrei.

Im 2. Falle handelte es sich um einen weichen, schwarzen, infiltrierend wachsenden Tumor mit ödematös-fibrösem Stroma und wenigen kuboiden, epithelialen, pigmentierten Zellen mit hyperchromatischen Kernen und nur wenigen Mitosen. Da man die Geschwulst operativ nicht ganz entfernen konnte, erhielt die Pat. zusätzlich 2.4 gr-Std Radium. Nach 6 Monaten entfernte man eine kleine Nekrose vom Gaumendach, die jedoch kein Tumorgewebe mehr enthielt. Nach 5 Jahren ist die Pat. rezidivfrei. Die Verff. sind sich nicht ganz im Klaren über die Histogenese ihrer beiden Tumoren und halten eine Entstehung aus einer aberrierenden Speicheldrüse bzw. eine embryonale Missbildung für möglich.

Unser Fall glich denen des angeführten Schrifttums weitgehend. Es handelte sich um einen 2 Monate alten Knaben. Keine Tumorheredität. Normale Geburt, wog 3,090 g. Normale physische und psychische Entwicklung. Brustkind.

Die Mutter bemerkte mit 2 Monaten einen erbsengrossen Tumor an der Aussenseite der rechten Oberkieferalveolarwölbung. Dieser wuchs schnell und war einen Monat später bei der Aufnahme über pflaumengross. Das Allgemeinbefinden war völlig ungestört. Die Geschwulst war knochenhart, zum umliegenden Knochen nicht scharf begrenzt. Die darüberliegende Schleimhaut war unversehrt, nicht pigmentiert, nicht schmerzend. Ein Zahn war nicht zu sehen. Die Geschwulst presste den Oberkieferknochen auseinander und die Alveolarleiste nach unten. Klinisch glaubte man zuerst an ein Sarkom oder eine Kiefercyste.

Die mikroskopische Untersuchung einer Probeexzision ergab anfangs kein eindeutiges Bild. Kein Zahn oder Zahnanlage befanden sich im Material. Die Begrenzung des Tumors zur Umgebung konnte mit Hilfe der eingesandten, sehr kleinen Gewebsstücke nicht beurteilt werden. Der Tumor baute sich aus festem fibrösen Gewebe mit vielen kleinen Gefässen auf. In nächster Umgebung derselben sah man streifenförmige und nahezu alveoläre Komplexe von polygonalen oder länglichen Zellen mit runden oder ovalen polymorphen, chromatinreichen Kernen und feinkörnigem Cytoplasma. Die Zellverbände waren teilweise gelockert, kleine Zwischenräume zwischen sich einschliessend, die möglicherweise durch Zerfall bedingt waren. Teils lagen sie kompakt. Sie enthielten viel feinkörniges bis grobkörniges braun-gelbes Pigment, das negativ auf Eisenfärbung reagierte, sich mit Masson's Silberimprägnierungsmethode aber wie Melanin färbte. Eine ev. Formalinausfällung wurde durch Waschen des Präparates mit NH_4 und 70 % Alkohol, die das Pigment nicht veränderten, ausgeschlossen.

Es lag somit ein wahrscheinlich bösartiger Tumor vor, der möglicherweise 1. von einer Zahnanlage oder den sog. Malassez'schen Epithelinseln oder, 2. vom Knochen (evtl. Ewingsarkom) ausging oder 3. ein metastatischer Herd eines embryonalen neurogenen Tumors vom Sympathicoblastomtyp war. (O. Reuterwall und L. Santesson.)

Die Röntgenuntersuchung des Schädels zeigte einen expansiv wachsenden Tumor in der Gegend des rechten Proc. alveolaris maxillae aber keine weiteren Metastasen im Skelett.

Eine radikale Tumorexstirpation wurde wegen der Grösse des Tumors vorerst abgelehnt und der Patient bekam eine palliative Röntgenbehandlung von 1,800 r Haut-

dosis innerhalb von 13 Tagen. (Tagesdosis 150 r. 45.5 r/min., HWS 0.80 mm Cu, 165 kV, 15 mA, Feldgrösse 6 × 8 cm, FHD 50 cm). Der Tumor reagierte vorerst nur wenig auf die Behandlung und der Pat. wurde zur Beobachtung nach Hause entlassen. Nach 3 Monaten hatte sich der Tumor doch deutlich verkleinert. Das Allgemeinbefinden war wie vorher überraschend gut. Eine erneute Probeexzision zeigte das gleiche histologische Bild mit reichlichem melaninartigem Pigment. Nach Untersuchung reichlicheren histologischen Materials und hinsichtlich des unilokularen Tumors liess man die Annahme einer Metastase fallen und sah den Tumor als melanotischen Primärtumor an, der sich auf der Basis einer embryonalen Missbildung enwickelt hatte und primär lokale Malignität besass. (O. REUTERWALL und L. SANTESSON.)

Da sich der Pat. in einem relativ guten Allgemeinzustand befand und sich der Tumor deutlich verkleinert hatte, wurde eine Operation vorgenommen (T. SKOOG). Der Oberkiefer wurde partiell reseziert und der Tumor radikal entfernt. Er war beinahe hühnereigross, multilokulär-zystisch und hatte »gangartige Ausläufer in den Knochen hinein, die mit dunklen, bläulichen, weichen Massen angefüllt waren. Stück für Stück musste er mit der Knochenzange entfernt werden, bis man schliesslich eine glattwandige Höhle erhielt. Ein Teil der Mundschleimhaut musste dabei geopfert werden. Der kleine Pat. überstand den Eingriff überraschend gut. Die Wunde heilte komplikationsfrei. Bisher sind 9 Monate nach der Operation vergangen und der Pat. entwickelt sich weiterhin normal und ist bisher rezidivfrei und metastasenfrei. Er ist nun 18 Monate alt.

Die im Schrifttum aufgeführten Fälle sowie der unsrige zeigen deutlich, dass man kongenitale, melanotische Tumoren im Kiefer so früh wie möglich radikal operieren soll, auch wenn es technisch schwierig erscheint oder die Grösse sie evtl. inoperabel erscheinen lässt. Das infiltrierende und zugleich expansive Wachstum zerstören den Proc. alveolaris und die Zahnanlagen unter der normalen Schleimhaut und der unversehrten äusseren Knochenschale des Oberkiefers. Die radikale operative Entfernung ist erstrebenswert, aber auch eine prä- bzw. postoperative Strahlenbehandlung ist u. U. notwendig. Entsprechend der Strahlenempfindlichkeit jugendlicher Gewebe sind auch die Melanome der Säuglinge strahlensensibler als die der Erwachsenen. Im Falle DUDITS' und SÖDERBERGS, sowie bei unserem Pat. zeigten die Tumoren einen deutlichen Rückgang nach der Bestrahlung mit relativ kleinen Dosen. In den inoperablen Fällen führt die präoperative Strahlenbehandlung zu einer Verminderung des Tumors und erleichtert dem Chirurgen somit die Arbeit wesentlich, ja ermöglicht sie in manchen Fällen erst.

Die Prognose unseres Patienten ist aller Wahrscheinlichkeit nach gut, da präpubertale Melanome im allgemeinen klinisch gutartig verlaufen und die 4 analogen Fälle des Schrifttums auch einen gutartigen Verlauf zeigen. Betreffend der Histogenese unseres Tumors in Bezug auf die von KROMPECHER als ursächlich bezeichneten »débris épithéliaux paradentaires« kann leider nichts ausgesagt werden, da weder im Anfang noch bei den späteren Operationen ein Zahn oder eine Zahnanlage bemerkt und histologisch untersucht wurde.

SÖDERBERG hat in 4 Fällen Ober- und Unterkieferschnitte von 7—9 Monate alten Föten mikroskopisch untersucht zur evtl. Beantwortung

der von DUDITS und SZABO aufgeworfenen Frage nach der Herkunft des Pigments. Weder in den Zahnanlagen verschiedener Entwicklungsstadien, dem Schmelzepithel und den Resten der Zahnleisten, noch im Mundschleimhautepithel konnte er mit der Silberfärbung nach MASSON melanotisches Pigment finden. Dies schliesst natürlich nicht die Möglichkeit der epithelialen Pigmentbildung aus.

Der Zufall wollte es, dass Dr. KOK vom Radio-therapeutisch Instituut in Rotterdam als Gast bei uns war und über einen analogen Fall berichtete, der z. Z. von ihm behandelt wird. Hier handelt es sich um ein 4 Monate altes Kind, das einen 4 × 5 cm grossen Tumor im rechten Oberkiefer hat. Auch hier ist die Schleimhaut intakt, der Tumor hart und ein ausgebildeter Zahn erscheint nach unten herausgepresst. Histologisch liegt ein melanosarcomähnlicher Tumor vor. Klinisch dachte man ebenfalls an einen sarcomähnlichen, embryonalen Tumor. Da er vorläufig als inoperabel angesehen wurde, erhielt der Pat. eine palliative Röntgenbehandlung von 2,180 r in 10 Tagen (HWS 1 mm Cu, FHD 30 cm, Feldgrösse 8 × 10 cm). Auch hier zeigte sich nach 3 Monaten eine mässige Verkleinerung des Tumors.

Den histologischen Schnitten nach zu urteilen, handelt es sich um die gleiche Tumorart.

Wir danken an dieser Stelle Herrn Dr. G. KOK vom Rotterdamsch Radio-therapeutisch Instituut für die liebenswürdige Mitteilung seines Falles, der nach der Operation des Pat. in der Nederlandsch Tijdschrift voor Geneeskunde veröffentlicht werden wird.

Möglicherweise sind diese Tumoren nicht ganz so selten wie man dem Schrifttum nach annehmen möchte und sind vielleicht bisher in ihrer Sonderstellung nicht genügend beachtet worden.

ZUSAMMENFASSUNG

Es wurde ein Fall von sog. »Melanocarcinoma congenitum processus alveolaris« (Krompecher) im rechten Oberkieferalveolarfortsatz bei einem 2 Monate alten Knaben beschrieben und mit 4 bisher im Schrifttum aufgeführten Fällen identifiziert. Der Tumor erwies sich als strahlensensibel und schrumpfte nach einer präoperativen Röntgenbehandlung von 1,800 r innerhalb 13 Tage deutlich. Er wurde totalexstirpiert und der Pat. ist 9 Monate nach der Operation rezidivfrei.

SUMMARY

Description of a case of so called 'congenital melanocarcinoma of the alveolar process' (Krompecher) in the right upper jaw of a boy aged 2 months and review of four other cases from the literature. The tumour here reported responded well to pre-operative roentgen therapy (1,800 r) within 13 days. This was followed by radical extirpation and nine months after the operation, the patient was free from signs of recurrence.

RÉSUMÉ

Description d'un cas de prétendu mélanocarcinome congénital du bord alvéolaire (Krompecher) du maxillaire supérieur droit chez un garçon de deux mois et revue de quatre autres cas de la littérature. La tumeur présentée ici a répondu favorablement à la roentgenthérapie pré-opératoire (1,800 r) en 13 jours. Celle-ci fut suivie d'extirpation radicale; neuf mois après l'opération le malade ne présentait pas de signes de récidive.

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FROM THE PATHOLOGY LABORATORY (DIRECTOR: REIDAR EKER), AND CLINICAL DEPARTMENT (DIRECTOR: AXEL SCHEEL †), DET NORSKE RADIUMHOSPITAL, OSLO, NORWAY

MALIGNANT LYMPHOMATA

A review of the pathology, clinic features and therapy

by

Axel Scheel and *Eivind Myhre*

Pathology

The following account of a study carried out at Det Norske Radium Hospital on primary malignant diseases of the lymph nodes comprises the diseases which, in common Norwegian terminology, are termed reticulosarcoma, lymphosarcoma and lymphogranulomatosis. As a collective designation for these lesions the term 'malignant lymphomas' is now used more and more, particularly in American literature.

The terminology is diverse. Thus the designation lymphosarcoma is applied also to the entire group of malignant lymphomas except lymphogranulomatosis (STOUT, SUGARBAKER & CRAVER), and the term reticulosarcoma has been used for the whole group (ROBB-SMITH). More than fifty different designations of lymphogranulomatosis are found in the literature.

The first investigator to classify primary diseases of the lymph nodes in a separate group was HODGKIN (1832), and the leukemias were separated by VIRCHOW (1843). Among the remaining lymphomas KUNDRAT (1893) placed lymphosarcomas as a separate type of tumour of the lymph nodes, and these were subsequently differentiated into lymphoblastomas

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and lymphocytomas (RIBBERT). Lymphogranulomatosis was described by GREENFIELD in 1878, though it only became known through the studies of STERNBERG (1898). The designation 'lymphogranulomatosis', now the most popular one, was introduced by PALTAUF (1909). GOORMAGTHIGH (1925) described malignant proliferation of reticulo-endothelial cells in lymph nodes, and OBERLING introduced the term reticulosarcoma. Attempts have subsequently been made to classify these growths according to estimated extent of differentiation of the tumour tissue (GALL & MALLORY, 1942). The so-called follicular lymphoma, or Brill-Symmers disease, is also included among malignant lymphomas. It was originally described by BECKER (1901), but was only generally recognized as a separate type of tumour after the publication of the papers of BRILL (1925) and SYMMERS (1927).

The etiology of these conditions is unknown. Considerable disagreement still exists as to whether lymphogranulomatosis is a neoplasm while the others are regarded as such. The genesis has also not been elucidated. There seems to be a consensus of opinion respecting the separation of lymphogranulomatosis as a morbid entity, though some investigators claim that there is actually only one primary malignant tumour of the lymph nodes (CUSTER & BERNHARD), and that the different histologic types are only varieties of the same malignant process. Many scientists find support for this conception in the fact that during the course of the disease, transitions to different microscopic types have been observed. MOORE (1951) insists that only about twenty per cent of cases maintain a 'pure' type through the entire course of the disease and that more than half show two or more types. About forty per cent of the post-mortem cases with previous biopsy reveal complete change from one type to another (CUSTER & BERNHARD). On the other hand, GALL & MALLORY in their study of 618 cases of malignant lymphomas emphasize that the histologic type is remarkably constant. Three-fourths of the number of cases maintained their histologic type, while the remainder showed development towards less differentiated cell types during the course of the disease. The majority of authors probably classify cases into types according to the type of cells and cellular differentiation — from the most undifferentiated cell, the stem cell ('stem cell lymphoma', GALL & MALLORY) to the highly differentiated lymphocytoma as the opposite extreme. According to general opinion the mesenchymal stem cell in the lymph nodes forms the origin of the different cell types of the lymphoid tissue (MAXIMOV & BLOOM).

It was considered that it would be of interest if an attempt were made to discover to what extent such a group classification was of practical clinical significance and whether these groups demonstrated characteristic clinical features, such as variations in radiosensitivity or in prognosis.

The present material comprises 134 cases of malignant lymphoma. We have decided on a classification in which lymphogranulomatosis is separated, and the others are distributed into the following main groups: reticulosarcoma, lymphosarcoma, and follicular lymphoma, according to estimated increasing differentiation of the tumour tissue. In the majority of cases only one biopsy has been made and in only a few cases, post-mortem examination performed. We have had no opportunity, therefore, of investigating whether a type may show transition to other types during the course of the disease.

1. *Reticulosarcoma.* This group consists of 49 cases. Microscopy reveals, as in all cases of malignant lymphoma, that the lymph node structure is blurred, and the capsule is penetrated (fig. 1—4). The tissue is dominated by the reticulum-like cell. There is a rather marked difference in size and shape of the cells, as described by GALL & MALLORY, who have divided this group into two sub-groups according to cellular differentiation, viz. stem cell lymphoma and clasmatocyte lymphoma. Our material provided no basis for such classification, as — so far as it may be evaluated — typical stem cell lymphomas could not be separated.

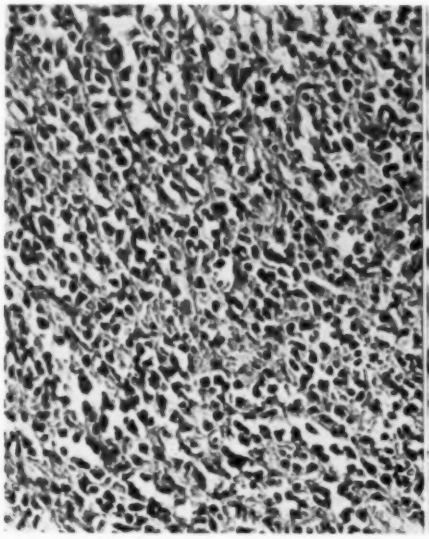

Fig. 1. Reticulosarcoma. × 200.

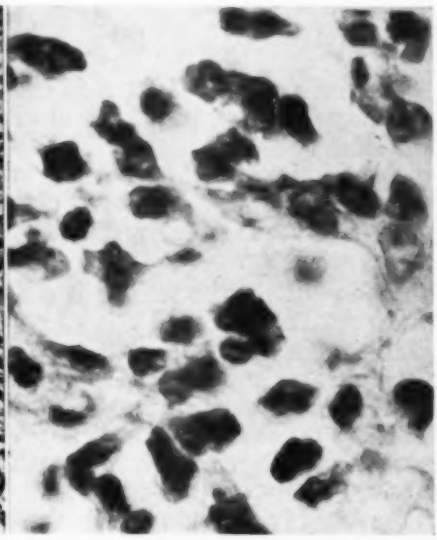

Fig. 2. Reticulosarcoma. × 1000.

Fig. 3. Reticulosarcoma. Silver stain. × 200.

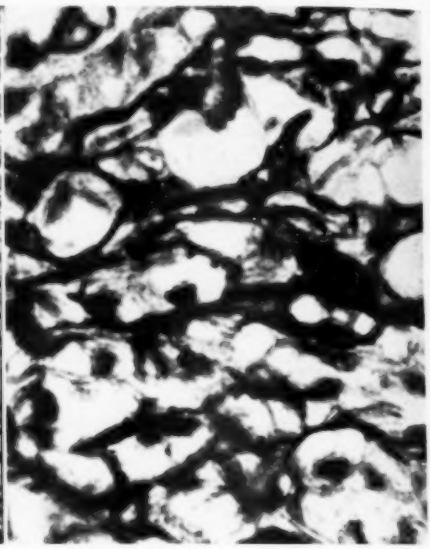

Fig. 4. Reticulosarcoma. Silver stain. × 1000.

The cells are large, round in shape, with a slightly eosinophilic cytoplasm, or they may be polygonal with offshoots resembling pseudopodia. The nuclei vary in shape and size — they are generally large, about double the size of that of a lymphocyte nucleus, or even larger. The shape is round or round-oval, but may also show minor indentations. Commonly the chromatin is delicate, sometimes with a marked nucleolus. Mitoses occur frequently.

As is known, the reticulum cells can produce argentophil fibrils. It seems natural to regard this as an expression of the extent of cellular differentiation. The present material, however, is too small for such classification, and the author will only mention the following: Silver staining of the sections was feasible in 41 cases, 18 of which showed an increased number of fine argentophil fibrils, while 23 cases did not show more fibrils than observed normally. In the first group two patients survived for five years, while five patients survived for five years or more in the second group. As mentioned, however, the figures are too small to enable any conclusions to be drawn.

In this material, therefore, the reticulosarcomas are presented in one collected group in accordance with the clinical data.

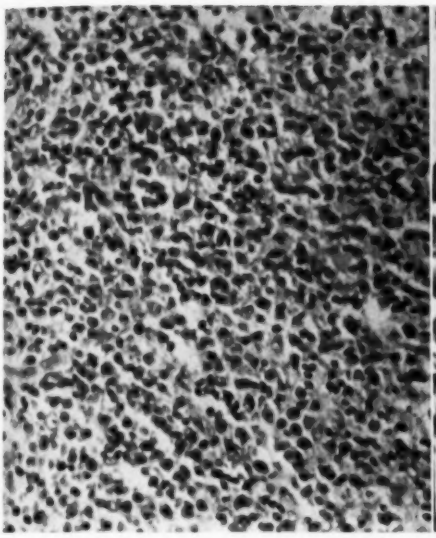

Fig. 5. Lymphoblastoma. × 200.

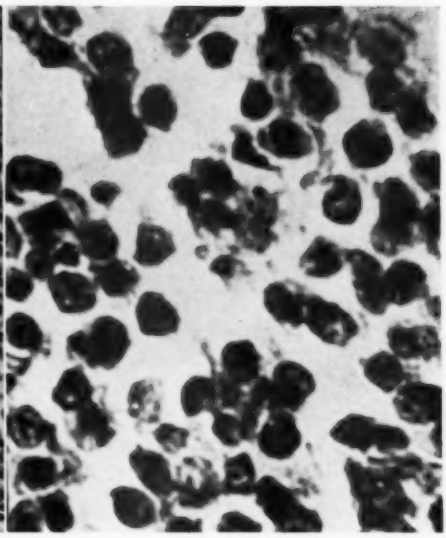

Fig. 6. Lymphoblastoma. × 1000.

2. *Lymphosarcoma.* In this group, which comprises 41 cases, a classification has been carried out in fixed sub-groups according to the extent of cellular differentiation.

The first group, the lymphoblastomas (fig. 5—6), comprises 16 cases and is dominated by the lymphoblast-like cell. It is larger than a mature lymphocyte, round in shape, though the edges may frequently be irregular and show small bulges. The cytoplasm consists of a narrow border. The nucleus is large compared to the cytoplasm, and larger than the nucleus of a lymphocyte. The shape is round, or very slightly indented. The chromatin is evenly distributed, densely, but not so densely as in the mature nucleus. The incidence of mitoses is comparatively high.

The second group, the lymphocytomas (fig. 7—8), comprises 25 cases in which it is difficult to distinguish the dominating cell from the normal lymphocyte, though cells more or less atypical in shape and size of the nuclei, are often found. Mitoses are relatively rare.

In both these sub-groups of lymphosarcomas, the usual finding of blurred lymph node structure is made, the capsule frequently being penetrated. This classification into sub-groups will be retained in the clinical study.

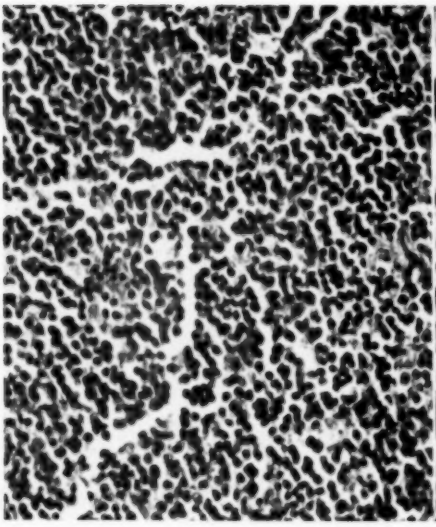

Fig. 7. Lymphocytoma. × 200.

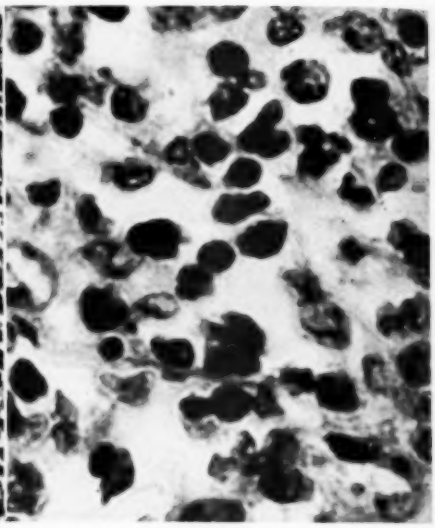

Fig. 8. Lymphocytoma. × 1000.

3. *Follicular lymphoma* (*Brill-Symmers' disease*). As mentioned, this group, which comprises three cases only, is of relatively recent date. It is characterized by numerical as well as dimensional hyperplasia of follicle-like nodes (fig. 9). The follicles are bordered by a zone of closely packed lymphocytes, which gradually merge into the surrounding parenchyma. In some cases the follicles consist practically exclusively of lymphocytes. The follicles vary in shape and size, and are distributed over the entire lymph node as opposed to the normal lymph node, in which the follicles are found only peripherally. This group was at first considered to be benign. The changes are precancerous, however, even if it takes years to observe development into one of the other types of malignant lymphoma.

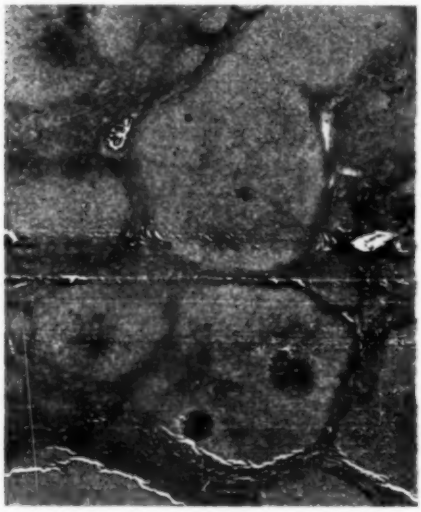

Fig. 9. Follicular lymphoma. × 30.

In the present material, there-

fore, we have chosen to include this group among malignant lymphomas, as is usual in recent literature (MOORE, GALL & MALLORY). Indeed, one of our cases followed a particularly malignant course.

4. *Lymphogranulomatosis* (*Hodgkin's disease*). While the previously mentioned malignant lymphomas present a uniform microscopic picture, this group, comprising 41 cases, is characterized by the variability of the cellular elements (fig. 10—12). Granulation-like tissue is found, with reticulum cells and fibroblasts, lymphocytes and plasma cells, granulocytes, often with marked eosino-

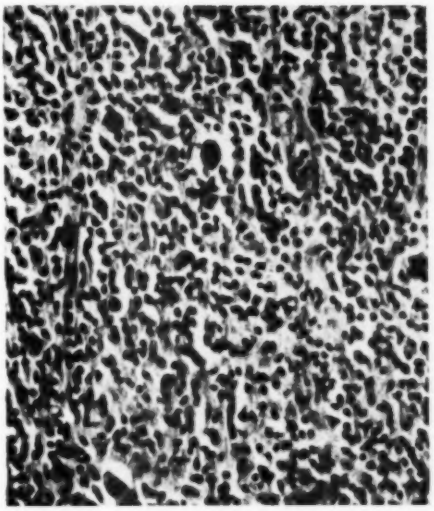

Fig. 10. Lymphogranulomatosis. × 200.

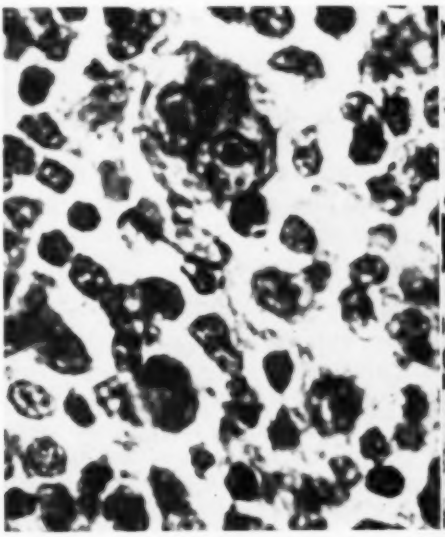

Fig. 11. Lymphogranulomatosis. × 1000.

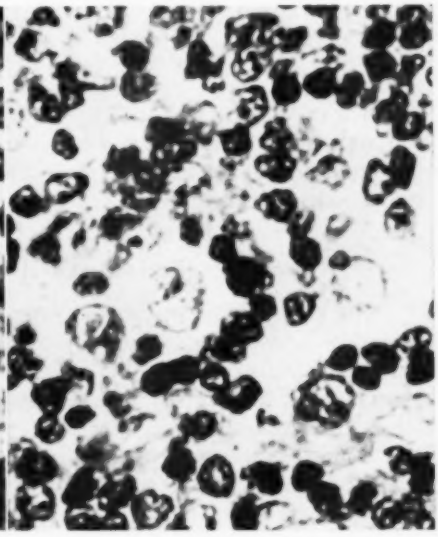

Fig. 12. Lymphogranulomatosis, resembling Hodgkin's sarcoma, with predominance of giant cells, although many lymphocytes are seen. × 1000.

philia, and finally the cell which is regarded as pathognomonic, viz. the giant cell of the Sternberg-Reed type. It resembles the so-called lymphoid stem cell and may be polynuclear or mononuclear with lobulated nucleus. The cytoplasm may be basophilic as well as eosinophilic, generally very profuse. The separate nuclei are round, round-oval or slightly indented. Nucleoli are frequently observed. Neither are mitoses rare in these cell forms, while they are rare in the other cells. Most frequently, some development of connective tissue is often observed, the amount of which, however, varies considerably.

In lymphogranulomatosis, differential diagnostic difficulties between inflammation on one hand and undifferentiated reticulosarcoma and lymphoblastoma on the other hand may occur. In the present material the diagnosis is looked upon as being definite in all cases, pathognomic cells having been revealed in each one; this also applies to the only occasional finding of eosinophilia.

This group has also been divided into sub-groups according to the histologic picture. According to JACKSON & PARKER there are three types, *i. e.* Hodgkin's paragranuloma, a relatively benign variety, which may develop into Hodgkin's granuloma and which, in turn, may change into Hodgkin's sarcoma. In our material we have found no typical appearances justifying such classification. A group has been separated, however, which consists of eleven cases, having a certain similarity to the disease designated Hodgkin's sarcoma and in which a more uniform, tumour-like appearance made up of giant cells, is found. As mentioned, none of our cases was typical, but there was a marked wealth of large cells. In the clinical study lymphogranulomatosis has been divided into two groups, the common form and the sarcomatous form, which, however, present no essential differences.

Clinical and Radiologic Features

The varieties of malignant lymphoma mentioned above have several features in common, clinically as well as therapeutically. To a certain extent, therefore, they may be looked upon as belonging to one collective group. As a matter of course, however, it is of interest to evaluate the clinical and therapeutic conditions in each group separately. In the present study, three cases of follicular lymphoma have been included as being of the highest grade of differentiation of lymphosarcoma. Opinions may vary as to the correctness of this, but the fact that one of these three patients died with signs simulating lymphatic leukemia, makes that such classification will have no appreciable influence on the results of treatment of lymphosarcomas on the whole — no more favourable view being taken of these than justified. The material includes all definitely

diagnosed cases of lymphogranulomatosis, lymphosarcoma and reticulosarcoma which have received treatment at Radium Hospitalet during the period 1936—1947 inclusive. All data have been compiled as from the day of admission, no consideration having been paid, therefore, to the duration of the disease before that time. The figures are small for the separate groups no percentual estimation therefore being feasible. As a rule, however, a distinct tendency is observable.

Age distribution. There is a considerable distribution of the cases over almost all age groups. In this respect the malignant lymphomas differ distinctly from the carcinomas.

Sex distribution. There is an excess of males — double the number of females — admitted into Radium Hospitalet for malignant lymphoma. This sex distribution is about equal in the three groups, and the proportion does not differ appreciably from that in other materials.

Extension of disease on admission. This is interesting to note as it gives an impression as to the spread of the disease. It may be registered partly by the number of glandular regions invaded, partly by the occurrence of extraglandular affections. A glandular region in this connection indicates, for example, a mandibular field; a retromandibular field, a cervical field; a supraclavicular field, an axillary field, and so forth. No separate glands are in question, therefore, but the affection of one or more glands in an anatomically circumscribed area. Even if more neighbouring glandular fields are invaded, each glandular area has been calculated separately in this material.

Table I

Glandular Regions involved at Beginning of Treatment

	One glandular region	Two glandular regions	Several glandular regions
Lymphogranulomatosis	12	12	16
Hodgkin's Lymphoma	9	8	12
Hodgkin's Sarcoma	3	4	4
Lymphosarcoma	16	4	24
Follicular Lymphoma	1	1	1
Lymphocytoma	12	1	12
Lymphoblastoma	3	2	11
Reticulosarcoma	11	8	24

In the present material, lymphogranulomatosis occurs almost equally often with involvement of one, two or more glandular areas. Lymphosarcomas seem to be inclinded to involve one glandular area only, or three or more glandular areas. In the former case it may be justifiable to

consider that the disease is still in a localised, early stage. We shall endeavour to show how this fact coupled with adequate treatment gives a better prognosis. It should be further observed that lymphoblastomas occur only rarely with involvement of only one glandular region, while as far as lymphocytomas are concerned, involvement of only one glandular area is found equally frequently as multiple glandular-regions. Reticulosarcomas with involvement of several glandular regions are most generally found on admission.

Extraglandular affections have a rather high incidence in all groups at the commencement of treatment. In lymphogranulomatosis the affections in question are most frequently intrathoracic, mediastinal tumours being chiefly predominant. In cases of lymphosarcoma and reticulosarcoma, there is a greater incidence of involvement of organic systems other than the chest, the skeleton and the abdomen. It is then generally a question of tumours of the epipharynx and of the tonsils being partly

Table II

Extraglandular Involvement at Beginning of Treatment

	Chest[1]	Skeleton	Abdomen	Other situations
Lymphogranulomatosis	18	3	1	3
Hodgkin's Lymphoma	12	2		2
Hodgkin's Sarcoma	6	1	1	1
Lymphosarcoma	6		6	10
Follicular Lymphoma			1	1
Lymphocytoma	2		2	5
Lymphoblastoma	4		3	4
Reticulosarcoma	7	3	8	14

the primary seats of the glandular affection. Among the reticulosarcomas extraglandular involvement alone was found in five cases on admission (one sternal, one dermal, two epipharyngeal and one tonsillar).

Hematologic features. It must be pointed out that the present material is not sufficiently representative for an evaluation of the hematologic features generally, due to the fact that patients in Norway with a leukemic blood picture are regarded as medical cases and are therefore not referred to Radium Hospitalet. At the same time, a consideration of the hematologic conditions in our material may be of interest.

Leukocytosis occurred in almost half the number of cases of lymphogranulomatosis examined though in all cases, moderate, and as a rule a relative, lymphopenia also existed. No leukemic blood picture has been

[1] For practical reasons mediastinal affections are included, even if they concern mediastinal lymph nodes.

demonstrtead in lymphogranulomatosis. Leukocytosis was rare on the whole in acses of reticulosarcoma, and no leukemic blood signs were demonstrated.

In lymphosarcoma, the hematologic appearances are of particular interest. In this material leukocytosis occurred in about one-third of the number of cases examined, and generally to a marked degree — more than 25,000 white blood cells per cubic millimetre. As a rule, a relative lymphocytosis was found and it is obvious that in the majority of cases there is a blood picture of leukemia. In all these cases of leukocytosis, the same proportion of grades of differentiation into lymphocytoma, lymphoblastoma and follicular lymphoma as in the total material was found. It appeared that all these lymphosarcoma patients with leukocytosis had a considerable spread of the disease, and they all died in the course of two years.

If one should venture to draw any conclusion on the basis of these small figures, it would be that the material comprises some cases of moderate leukemia, which perhaps might be regarded as transitional cases between the aleukemic lymphosarcomas and the genuine leukemias, and further that these leukemias demonstrate a considerable tendency to spread and a particularly poor prognosis. No correlation seems to exist between the presence of a leukemic blood picture and the histologic findings.

Results of Treatment

All patients in the present material have been treated with irradiation. In a smaller number of cases, surgical extirpation of the tumour has also been performed prior to the irradiation. This has always been local, however, and no radical glandular dissection has been carried out. Even if it may be difficult to decide on the effect of the irradiation alone and on the effect of the actual extirpation, it would probably not be safe to trust to the effect, by itself, of the latter.

The main purpose of the present material is to endeavour to ascertain whether the dose of irradiation influences the duration of life, and whether a high dose of irradiation may present prospects of curing these diseases. In an endeavour to arrive at conclusions, a rough compilation has been made of two categories of irradiation therapy, viz. so-called complete irradiation with a skin dose of a minimum of 3,000 r on all manifest lesions, and incomplete irradiation in which these demands have not been met. The usual factors have been: 175 KV, 4 MA, 0.5—1 mm Cu, and 40—50 cm skin distance. The small number of total irradiations given had no appreciable effect in any individual case. Occasionally, teleradium has been employed, and the same criteria have been advanced for radium as for roentgen irradiation. In this material, chemotherapy has been

used only occasionally in some of the late recurrences during the past few years (the collection of the material having been concluded in 1947). Preceding treatment at other hospitals has, on the whole, played no great part and therefore has no appreciable influence on this material.

Five-Year Survivals

Twenty-eight per cent of the total of 134 cases of malignant lymphomas were alive after five years. Lymphogranulomatosis has the highest number of five-year survivals, reticulosarcoma the lowest. It should be emphasized that all the patients suffering from lymphosarcoma and reticulosarcoma and who survived after five years, have received what we have termed 'complete irradiation treatment'. Thirteen of the sixteen surviving patients with lymphogranulomatosis were given similar treatment.

Table III

	Lympho-granulomatosis	Lympho-sarcoma	Reticulo-sarcoma
	41	44	49
Survival 5 years	9	4	3
» 6 »	1	1	
» 7 »	1		
» 8 »	1	3	4
» 9 »	1	1	
» over 10 years	3	5	1
Survived more than 5 years	16	14	8
Complete irradiation	13	14	8
Tumour extirpated		7	1

Deaths within Five Years

It is remarkable that there is a certain even distribution of fatalities over the five years in lymphogranulomatosis while, in the cases of lymphosarcoma and reticulosarcoma, a marked tendency to an accumulation of

Table IV

Results of Treatment

Deaths:	Lympho-granulomatosis	Lympho-sarcoma	Reticulo-sarcoma
	41	44	49
Survival less than 1 year	9	22	33
» 1—2 years	4	2	5
» 2—3 »	6	3	2
» 3—4 »	3		1
» 4—5 »	3	3	
Died within 5 years	25	30	41
Complete irradiation	10	7	17

fatalities in the first year is present. Further, it should be noticed that a much smaller number of patients who died within five years, has received 'complete' irradiation. Such treatment has been given in no more than approximately one-third of the number of cases.

Subsequent Fate of Five-Year Survivals

It will be observed that in lymphogranulomatosis the spread of fatalities continues to some extent into the control period after five years. It is remarkable, however, that all patients with lymphosarcoma and reticulosarcoma, who survived at the five-year control, also live symptom-free to-day. (These patients have been followed-up for periods of up to eleven years.) One has the impression that many of these patients might, with considerable justification, be characterized as cured. In this material 77 out of 93 cases, *i. e.* more than 80 per cent, of lymphosarcoma and reticulosarcoma either succumbed in the course of the first year, or survived free from recurrence during the whole of the period of observation.

Table V

Subsequent Fate of Patients alive at 5-year Follow-up

	Died later	Survive with recurrence	Survive without recurrence
Lymphogranulomatosis 16	5 years: 3 8 years: 1	10 years: 1	11
Lymphosarcoma 14			14
Reticulosarcoma 8			8

The significance to the prognosis of the degree of differentiation of the tumour. No correlation is to be found between the prognosis and the classification of lymphogranulomatosis into Hodgkin's lymphoma and Hodgkin's sarcoma. With regard to lymphosarcoma, the classification into degrees of differentiation appears to be of great importance to the prognosis. The prognosis in lymphoblastoma appears to be very poor, while it is considerably better in lymphocytoma.

Results of treatment in correlation to the extent of the disease. It is clear that the extent of the disease must directly influence the prognosis and the chance of carrying out complete irradiation, such therapy being impossible in cases with marked multiple spread. This fact naturally reduces the significance of the figures in Table III when observed separately.

There is a higher number of cases among the five-year survivals who have affection of only one glandular region than of two or more glandular regions. Correspondingly, among the patients who died within five years, involvement of a greater number of glandular regions is most frequent.

As is only reasonable, extraglandular affections are preponderatingly most frequent among patients who died within five years. The five-year survivals comprise only a few mediastinal tumours in lymphogranulomatosis, and some tumours of the epipharynx or of the tonsils in lymphosarcomas and reticulosarcomas.

It is remarkable, however, that the correlation between the extent of the disease and the prognosis does not show the same relationship as does the correlation between the irradiation dose and the prognosis (Table III). It therefore appears justifiable to conclude that in fact the irradiation dose is of significance to the prognosis as far as the survival period is concerned, with the proviso, however, that the disease is not too widespread.

Table VI

Results of Treatment in Correlation to general hematologic Findings

The Numerator indicates Number of Pathologic Findings, the Denominator Number of Cases examined

	Hemoglobin < 75 %	Leucocytes < 5,000	Leucocytes > 10,000
5-year survival:			
Lymphogranulomatosis		1/16	2/16
Lymphosarcoma		1/14	
Reticulosarcoma			
Died within 5 years:			
Lymphogranulomatosis	6/25	2/25	10/25
Lymphosarcoma	3/29	2/29	9/29
Reticulosarcoma	2/37	5/37	3/37

Anemia, leukopenia and leukocytosis are rare findings in the five-year survivals in all groups. In patients who die within five years, a small number of moderate cases of anemia and leukopenia is found at the start of the treatment and a slightly higher number of cases of leukocytosis, except for the reticulosarcomas.

In lymphogranulomatosis, relative lymphopenia and in lymphosarcoma, relative lymphocytosis, have been found most frequently in the surviving patients as well as in those who die within five years. There is only a moderate number of cases of eosinophilia in all groups. This sign represents no prognostic factor nor does a shift to the left, which is more frequent, and occurs on an average in about half the number of cases in all groups.

Results of treatment in correlation to the sedimentation reaction. The figures show no marked tendency. Even if the five-year survivals generally have lower sedimentation rate at the commencement of the treatment in all groups than the patients who die within five years, the sedi-

mentation reaction based on this material cannot be considered to be of prognostic significance.

Table VII

Results of Treatment in Correlation to special hematologic Findings

The Numerator indicates Number of Pathologic Findings, the Denominator Number of Cases examined

5-year survival:	Lympho-penia	Lympho-cytosis	Eosino-philia	Young forms
Lymphogranulomatosis	6/16	1/16	4/16	8/16
Lymphosarcoma	1/12	3/12	2/12	5/12
Reticulosarcoma		1/2	1/2	
Died within 5 years:				
Lymphogranulomatosis	13/21	4/21	5/21	12/21
Lymphosarcoma	3/25	12/25	7/25	11/25
Reticulosarcoma	11/26	5/26	5/26	11/26

Significance of general conditions to the prognosis. It is observed that in this material symptoms such as increased temperature and reduced general condition in lymphogranulomatosis need not necessarily mean a grave prognosis, as several patients with such symptoms survived after five years. As to lymphosarcomas and reticulosarcomas it may be noted that none of the surviving patients, suffering from these diseases, had an increased temperature or a reduced general condition at the institution of the treatment these occurring only in patients who died. The symptom of itching has been found remarkably infrequently at the beginning of the treatment. No particular weight can be attached to this observation, as it may be the result of inaccurate case records.

Significance to the prognosis of age and sex distribution. It has not been considered necessary to compile tables to show these relationships. It has to be underlined only that the prognosis does not vary in this material, neither in the different age groups nor in the two sexes.

Primary radiosensitivity and acquired radioresistance. As also found in other materials published, the radio-sensitivity is highest in lymphogranulomatosis and lymphocytoma and somewhat lower in lymphoblastoma and reticulosarcoma. Primarily completely radio-resistant reticulosarcomas and lymphoblastomas have been found only quite exceptionally. This feature has not been found at all in lymphocytomas and lymphogranulomatosis.

Many investigators look upon the conception 'acquired radio-resistance' as a frequent occurrence, insofar as they frequently count upon its probability when repeated treatments have to be given. It is difficult to be sure about this, as the evaluation of 'acquired radio-resistance'

always has to be subjective. Further, it is hard to decide whether 'acquired radio-resistance' has been caused by the effect of previous irradiation or whether the actual tumour *per se* changes from a radio-sensitive into a radio-resistant form, independently of possible previous roentgen irradiation. An endeavour has been made in this material to estimate how often acquired radio-resistance appears to exist on subsequent treatment of recurrences in malignant lymphomas. It will be seen that such acquired resistance has not been found particularly frequently, and in lymphosarcoma only very rarely. In the majority of cases it appears as if the late recurrences have reacted locally just as favourably to irradiation as the previous affections of the identical disease. A certain impression remains that the significance of the conception 'acquired radio-resistance' may possibly have been somewhat exaggerated.

Conclusions

Pathology. Malignant lymphomata may be distributed into several histologic sub-groups according to the type and differentiation of cells. The extent of this classification depends upon the clinical features. We have decided on a classification in which, on the one hand, lymphogranulomatosis with its familiar polymorphous histologic picture, has been placed in one group. We have found no typical features warranting the distribution of lymphogranulomatosis into sub-groups. The remaining malignant lymphomata have been distributed into reticulosarcomas — in which the reticulum-like cell predominates — and lymphosarcomata which are divided into lymphoblastomata and lymphocytomata, according to whether the predominating cell resembles a lymphoblast or a lymphocyte. In the last sub-group of malignant lymphomata is included follicular lymphoma (Brill-Symmers' disease), characterized by hyperplasia of follicular nodes, and which, in a shorter or longer period, changes into one of the other malignant lymphomata.

Clinical and radiologic features. 1. Upon first admission to hospital, cases of lymphogranulomatosis equally frequently involved one, two or more glandular regions. In the presence of lymphoblastoma it was rarely that only one glandular region was involved, while this more frequently so in cases showing lymphocytoma. In the latter event, localized early stage must be presumed to exist. Reticulosarcomas are apt to occur more often with involvement of three or more glandular regions than a lower number.

2. Upon first admission, cases presenting extraglandular involvement had rather a high incidence. In lymphogranulomatosis, mediastinal tumours were most frequently present; in lymphosarcoma and reticulosarcoma there was usually tonsillar and epipharyngeal involvement.

3. The material is non-representative as far as the incidence of leukemic forms is concerned, because in Norway these diseases are generally referred to the departments of internal medicine. All the same, a leukemic blood picture is shown by about one-third, the number of cases of lymphosarcoma included, partly moderately pronounced as a transitional form between lymphatic leukemia and lymphosarcoma.

All these cases with leukemic blood pictures showed extensive spread of the disease, and no patient survived for more than two years. No correlation seems to exist between the occurrence of a leukemic blood picture and the histologic findings.

Results of therapy. 4. About 28 per cent of the 134 cases of malignant lymphoma survived for more than five years. The highest number of survivals was found in lymphogranulomatosis, the lowest in reticulosarcoma. It was remarkable that almost all survivals had received complete irradiation. In lymphogranulomatotis there was a certain increase in the number of deaths after five years, while all cases of lymphosarcoma and reticulosarcoma which survived for five years, are alive to-day without recurrence. The fatalities in the latter two groups occurred as a rule in the course of the first year.

5. The prognosis for lymphocytoma is much better than for lymphoblastoma.

6. The extent of the spread of the disease, the presence of pluriglandular and extraglandular processes, also influence the prognosis, though not to such a marked degree as the size of the radiation dose. It may be concluded from this that the dose is of significance to the duration of life, and that high radiation doses give chances of cure.

7. Acquired radioresistance appears to occur but judged by the present material, plays no important rôle.

SUMMARY

Following a record of the pathologic-anatomic classification of malignant lymphomata (lymphogranulomatosis, lymphosarcoma, and reticulosarcoma), certain clinical features together with the results of treatment are reviewed. Particular weight is attached to the significance of the radiation dosage to the subsequent fate of the patients.

ZUSAMMENFASSUNG

Einem Protokoll über die pathologisch-anatomische Klassifizierung der malignen Lymphome (Lymphogranulomatose, Lymphosarkom und Retikelzellsarkom) folgend werden gewisse klinische Bilder zusammen mit den Behandlungsresultaten kritisch untersucht. Spezielles Gewicht wird auf die Bedeutung der Strahlendosis für das spätere Schicksal der Patienten gelegt.

RÉSUMÉ

Après un rappel de la classification anatomo-pathologique des lymphomes malins (lymphogranulomatose, lymphosarcome et réticulosarcome), les auteurs passent en revue certains caractères cliniques et les résultats thérapeutiques. Ils insistent spécialement sur l'influence de la dose de rayons sur l'évolution ultérieure.

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BOOK REVIEWS

LEHRBUCH DER RÖNTGENOLOGISCHEN DIFFERENTIALDIAGNOSTIK von Werner Teschendorff. Band I. Erkrankungen der Brustorgane. Dritte, verbesserte und wesentlich erweiterte Auflage. Georg Thieme, Stuttgart, 1952. 954 Seiten, 1,030 Abb. DM 129. —.

The first edition of this textbook was published in 1939 and a second edition printed in 1950. The latter was exposed to much criticism as it did not deal with the latest advances in the diagnostics of the thorax. The author has attempted to repair this defect in the edition which now appears. Nevertheless, the book seems startlingly out of date, the manner of observing radiologic problems being several decades behind the times. The author starts with certain types of appearances and writes fully and in detail about all the diseases which may cause them. This means that, by reason of the different roentgen appearances produced in its various stages, the one and the same condition appears in several places in the book. As an example, it may be mentioned that silicosis is found in sixteen separate situations. In the discussion of possible differential diagnoses, clinical and radiologic signs are accorded equal emphasis. While radiology of to-day strives to analyse pathologic anatomy with the assistance of fluoroscopy and methodic radiography, the author bases diagnosis upon a few standard projections. He appears to look at things in a figurative rather than an anatomic manner, the most serious fault of the textbook from the radiologic point of view.

This is shown as early as the first part of the first chapter. Under the heading of 'Die Verschattungen einer Brusthälfte', opacity of one side of the thorax becomes the subject for an effusive discussion, comprising some 34 pages, in which a number of diseases are given as possible causes. The reviewer considers such reasoning to be wrong in principle. The examiner finds at the first glance on screening that a pathologic process is present in one or other half of the thorax. His immediate line of thought and reaction should then be to try to decide the situation and nature of the lesion by radiologic means. One has the right to demand that before the patient has left the roentgen department the examiner should have determined whether the opacity was in the nature of a pleural exudate, a parenchymatous process or both, if a narrowing of any of the larger bronchi existed or was probable, whether there were signs in the films to indicate changes in the mediastinum, etc. To place in the hands of a future radiologist a book which does not stress these points, is to lead him in the wrong direction. The future diagnostician should not be taught to carry out his work with the help of clinical reasoning which, for obvious reasons, he cannot master. The radiologist should be but a radiologist and carry his diagnosis as far as the technical resources permit. This is certainly not indicated in this textbook.

The same figurative, unanatomic manner of reasoning continues chapter after chapter and the author perpetually reveals how old-fashioned is his mode of thinking.

In the chapter on interlobar pleurisy, a number of roentgen films are reproduced without any mention of pathologic-anatomic verification. This may indeed be said, with few exceptions, of the book as a whole. It is therefore inevitable that the reader may often question the diagnosis. On the whole, as far as can be judged, it is mostly parenchymatous and bronchial processes of various kinds rather than pleural effusions that are described in this chapter.

The examples mentioned are enough to typify the part of the work dealing with pulmonary diagnosis. To deal in detail with every point upon which a modern trained radiologist might hold a divergent opinion, would involve writing a book equally as thick as

the one under review. There is, as a matter of fact, hardly a single page which does not contain several unclear statements or even obvious mistakes.

The chapter on the diagnosis of the heart begins with some general points of view concerning the healthy and the diseased heart. Kymography by the Stumpf methods is dealt with in no less than 28 pages. Electrokymography is covered briefly and the assessment of the value of the method is relegated to the future. The description is evidently based wholly on a study of the literature. The author does not appear to have had any personal experiences of the method. He points out the electrokymographic findings in certain congenital and acquired heart diseases and mentions the importance of the method in the differential diagnosis between a tumour and an aortic aneurysm. In the opinion of the reviewer, the importance of electrokymography has hitherto been the greatest in the diagnosis of early mitral stenosis and mitral insufficiency, the latter being extremely difficult to establish by ordinary clinical methods. This significant fact is not mentioned by the author.

Angiocardiography is dealt with in some few pages. It is again noticeable that the author appears to have had no experiences of his own. JANKER's cinematographic method is mentioned as being the best. Without wishing to belittle JANKER's extraordinary contribution to the development of angiographic technique, the reviewer must emphatically make reservations regarding the unconditional opinions expressed by the author. When it is a matter of a detailed study of the anatomy of a certain region of the heart or great vessels, an individual selective method of examination is preferable. It is only for malformations of the aorta that the author, with some hesitation, recommends selective contrast injection.

The section dealing with the position of the individual chambers of the heart as seen in roentgen films obtained in different projections is the only one in the whole book that has a purely anatomic basis and is therefore worth reading, even if expressions like 'Cava-Dreieck' show that the author has not been able entirely to shake himself free from his figurative conceptions. He returns to them enthusiastically when he writes about the shape of the heart. Almost at once, he mentions the division, used in the past, of the heart outlines into arches: 'In the postero-anterior view, on the left side, there are four arches', etc. In the text that follows, it is explained which organs or parts of organs form these arches. Why not discuss then these anatomic considerations directly and without periphrases? It is for example better and more clear to talk about the arteria pulmonalis than the pulmonary arch.

A motley collection of a most varied nature of conditions are discussed under the heading of 'Kugelförmige Herzen'. 'Not enlarged, ball-shaped hearts' are mentioned first, followed by 'athletic hearts, working hearts, senile ball-shaped hearts, ball-shaped hearts with thyrotoxicosis and hearts with nephrosclerosis'. Then follows 'Kugelförmige Herzen mit vorspringendem Pulmonalbogen'. On page 645, there is a frontal view of a heart, grossly deviated from the normal, which is supposed to be a healthy heart with a pulmonary arch and left auricle displaced forwards. The heart may be healthy but the reader is left wondering what in this case has caused the pathology shown in the roentgen film. There is no mention of any anatomic verification.

The appearances in congenital heart diseases are divided into three main groups:

1. Ball-shaped hearts with bowing of the pulmonary arch.
2. Ball-shaped hearts without bowing of the pulmonary arch.
3. Hearts which are neither ball-shaped nor show bowing of the pulmonary arch.

A division of this description lacks every ounce of theoretical and practical argument. The patent ductus arteriosus is given in a few pages. The diagnosis is based upon twelve different signs, mainly clinical. The description of the roentgen signs is very vague.

In his description of septum defects of the auricle, the author makes no clear differentiation between those cases that have a left to right shunt and those in which the shunt is from the right to left. This is also true of those radiologists who have supplied angiographic illustrations. The result is that one obtains no clear conception of this deformity and its roentgen diagnosis.

After the author has described mitral malformations, the last group of his 'ball-shaped hearts', he proceeds to 'duck- or boot-shaped hearts'. What appalling notions! On page 686 there is a film portending to illustrate a 'horizontal athletic heart'. Whether it is an athletic heart it is difficult to judge but one gains a definite impression that if the patient had breathed in somewhat more deeply, the heart would have been less horizontal.

Some further general views may be added to the above more serious and principle criticisms. The method of description is characterized by marked obscurity and absence of concentration. The roentgen findings have not been verified, or only incompletely so. Clinical and radiologic facts are mixed pell-mell and there are many errors. Useful and useless information are given side by side without discrimination. A reader, not himself possessing considerable experience of roentgen diagnosis, has no possibility of deciding which of the abundant facts are of importance and which are of no significance. A number of angiocardiographs with legends attached fit well into the general style of the work. It is surprising that a textbook of this quality has run to three editions, the last appearing only two years after the preceding one.

Gunnar Jönsson.

A Roentgenologic Study of the Coronary Arteries in the Living. By Lucio Di Guglielmo and Mariano Guttadauro. 82 pp, 49 illustrations. Acta radiol. Suppl. 97, Stockholm 1952.

The investigations described have been made on material collected in Roentgen Department I of Södersjukhuset, Stockholm, from 1947 to 1951. Patients were examined by means of angiocardiography or aortography for various diagnostic purposes. Three hundred and twenty-six examinations were made: 150 thoracic aortographies and 167 angiocardiographies. The method for aortography suggested by Radner and modified by Jönsson, Brodén, and Karnell has been employed (introduction of a catheter through the radial artery as far as the middle third of the ascending aorta). For angiocardiography the endovenous method was used 47 times and the selective method 120 times.

The majority of the patients (197) were suffering from congenital heart diseases; eight were normal; the remaining twenty-nine were suffering from various conditions.

The results obtained may be summarised as follows:

1) If the examination by thoracic aortography is correctly performed, a satisfactory filling of the coronary artery is always obtained. Failure to visualise the arteries may be due to technical causes, such as the incorrect position of the catheter, unduly slow injection of the contrast medium, or to particular pathologic conditions (severe incompetence of the aortic valves, patent ductus arteriosus with a large shunt, complex congenital malformations).

Visualisation of the coronary arteries during angiocardiography is occasionally encountered.

2) In thoracic aortography, age and sex have no influence on the filling of the coronary arteries. In the case of angiocardiography the visibility of the coronary arteries seems to be better in young subjects.

3) In most of the cases the filling and the emptying of the coronary arteries took place at the same time as the filling and emptying of the aortic bulb.

4) There is an evident correlation between the visualisation of the coronary arteries and the different phases of the cardiac cycle; the maximum filling of the heart vessels is obtained during ventricular diastole.

5) Thoracic aortography allows us to describe for the first time the roentgenologic patterns of the coronary arteries in the living organism. Almost all the branches described by the anatomists may be recognised in the radiograms, even the fine arteries which invade the interventricular septum.

By comparing the findings in the living organism with those made postmortem, we were able to observe some differences in the appearance and position of the ramifications of the left coronary artery. From a general point of view, however, the radiologic findings correspond to the classical descriptions of the anatomy.

6) No variations in the number and origin of the coronary arteries, corresponding to those described by the anatomists, have, however, been detected in the material examined. The more important variations observed were those related to the mode of division of the left coronary artery. Such variations are not frequent, and we can state that in most of the cases the radiologic appearances can always be referred to one fundamental scheme only.

7) The preponderance of one coronary artery, described by anatomists and clinicians, may be confirmed radiologically in the living organism. Although it is not possible to carry out a statistical study from the radiograms, it is possible to suggest that the preponderance of the right coronary artery is somewhat more frequent than the preponderance of the left. The radiograms clearly show the influence which may be exerted by the preponderance of a coronary artery on certain pathologic conditions of the heart vessels (arteriosclerosis, heart infarction, occlusions).

8) No direct or indirect radiologic data have been obtained for the study of the anastomosis of the coronary arteries and the collateral circulation.

9) The time during which the contrast medium remains in the coronary arteries could be estimated approximately. It varies in most cases from 2.5 to 4 seconds.

10) This finding, and above all the observation that no incidents occurred to any of the patients, lead the authors to assume that arteriography of the coronary arteries may be usefully employed for diagnostic purposes in coronary diseases, provided adequate equipment is available, and the technical principles described for thoracic aortography are strictly followed.

Autoreview.